ELECTROMAGNETIC INTERFERENCE EVALUATION OF S-IVB TELEMETRY GROUND SUPPORT EQUIPMENT

GENERAL TEST PLAN ITEM NO'S. AA-21, Z-4, Z-5, AA-9, AA-23, AA-16A, AA-73

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ABSTRACT

This report, prepared by the Douglas Aircraft Company, Inc., presents the results of Electromagnetic Interference tests of the Saturn S-IVB Telemetry Ground Stations. The report is tabular in form and includes the test results for the following Saturn S-IVB GSE models: -123, -125, -126, -127, -128, -136, and -296.

The purpose of the test program was to subject each item to Electromagnetic Interference and Susceptibility tests to verify that the item would function according to design requirements and to isolate problem areas for corrective action where deemed necessary. Except for Model DSV-4B-296, all models deviated from specification in at least one area of the test. However, based on the criteria that the ultimate qualification of the unit would depend upon its effect on system performance rather than operation as an isolated unit, all models were deemed satisfactory pending evidence to the contrary during system qualification. Subsequent system performance has confirmed this decision and no degradation in system performance has been detected as a result of the individual deviations found in these tests. It was found that the consoles in this report, the surrounding equipment, and the consoles in Santa Monica Report No. SM-47524 were not susceptable to radiated or conducted interference. This provided a guide line for the acceptibility of the test results in this report.

Descriptors: electromagnetic interference
EMI
qualification
susceptibility
radiated interference
ground support equipment

PREFACE

This report summarizes the results of the Electromagnetic Interference tests conducted on the DSV-4B Telemetry Ground Support Equipment. The testing period was from November of 1964 to February of 1966.

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1.0 INTRODUCTION

This report presents the results of Electromagnetic Interference and Susceptibility tests of the Saturn S-IVB Telemetry Ground Stations.

One specimen of each of the Models was subjected to EMI tests per the applicable paragraphs of Douglas Specification Drawing 7883817. The purpose of the test program was to verify that each model would function in accordance with design requirements and to isolate problem areas for corrective action where necessary. In addition, these tests were to provide data and electrical characteristics to be used in the system evaluation of vehicle and GSE Electromagnetic Compatibility. The tests performed and the test results for each model are summarized in Paragraph 2.0. The conclusion drawn from the test results is stated in Paragraph 3.0. Laboratory test procedures are described in Appendix 1. A list of all major purchased parts in each model is given in Appendix 2. Appendices 3 through 10 contain the laboratory data recorded during tests and the test setup for each model. A brief description of each of the end items tested is given in the following paragraphs. Appendix 11 contain a cross reference of Line Item and Model Numbers.

1.1 The Model DSV-4B-123, DDAS Ground Station, Part No. 1A59941-1, is a part of the automatic checkout link for the Saturn S-IVB vehicle. It receives and decommutates the vehicle PCM/DDAS data train for storage in the computer and will output a limited number of channels for real-time monitoring.

1.2 The Model DSV-4B-125, PAM/FM/FM Telemetry Ground Station, Part No. 1A59942-1, is a part of the automatic checkout link for the Saturn S-IVB vehicle. It consists of the equipment for receiving and decommutating any of three (3) PAM/FM/FM data links for output to the computer and has a selected number of channels available for real-time monitoring. This station is also the primary communication link between the computer and the other telemetry ground stations for selection of operating mode and operating status talkbacks.

1.3 The Model DSV-4B-126, Single-Sideband Ground Station, Part No. 1A59943-1, is part of the GSE Telemetry System for checkout of the Saturn S-IVB vehicle. It consists of the equipment for receiving and demultiplexing the single-sideband multiplexed signal from the vehicle and outputs these signals (vibration data) to an oscillograph display console for recording and monitoring.

1.4 The Model DSV-4B-127, Wideband Magnetic Tape Recorder, Part No. 1A77890-1, is part of the automatic checkout link for the Saturn S-IVB vehicle. It contains twelve (12) channels for real-time recording of telemetry signals, voice commentary, and system timing.

1.5 The Model DSV-4B-128, Frequency Calibration Unit, Part No. 1A72909-1, consists of the stimuli and monitoring equipment to test and calibrate the telemetry receivers in the ground stations in the automatic checkout link.

1.6 The Model DSV-4B-136, Destruct System Test Set, Part No. 1A59952-1, consists of the computer controlled stimuli to test the Destruct Receiver and Decode System on the vehicle.

1.7 The Model DSV-4B-296, Telemetry Signal Distribution Unit, Part No. 1B41812-1, is a part of the automatic checkout link for the Saturn S-IVB vehicle. It provides line matching and switching for "Closed Loop" RF and "Composite" Telemetry links and for "Open Loop" RF during Umbilical Drop Tests.

2.0 TEST SUMMARY

The test performed on each model and the results of each test are summarized in the tables shown on the following pages, Paragraphs 2.1 through 2.7.

Descriptions of the tests listed in the "Test Requirements" column are given in Appendix 1.

Laboratory tests data is given for each model in the appendix reference in the "Test Results" column.

A list of the major purchased parts in each model is contained in Appendix 2.

2.1 Model DSV-4B-123, DDAS Ground Station

TEST REQUIREMENTS	TEST RESULTS
A. Conducted Interference	Conducted Broad Band Steady State was out 28 db maximum between 1.25 MHz and 25 MHz on the 28 VDC Input Power Lines. Conducted Broad Band Steady State was out 19 db maximum between 300 KHz and 15.5 MHz on the 115 VAC Input Power Line. Evaluation of the above test results led to a redesign of the unit under test to include AC and DC line filters to suppress conducted interference. Following the filter installation a limited secondary EMI Test was performed in System Integration Laboratory. Broad Band Conducted Interference on the 28 VDC Power Line was lowered up to 18 db from readings made the same day without filters. Broad Band Conducted Interference on the 28 VDC Return Line was lowered up to 28 db except between 2.1 MHz and 4.6 MHz where an increase of 9 db maximum was experienced. The Broad Band Conducted Interference on the AC Power and Return Lines was lowered up to 53 db except for a 2 db increase at 5.5 MHz on the 115 VAC Power Line.

2.1 Continued

B. Radiated Interference	Broad Band Radiated Interferences were within specification limits. Narrow Band Radiated Interference was out 3 db at 23 MHz with the console doors closed. (Normal test operation) Narrow Band Radiated Interference (doors open) was out 11.8 db at 16 MHz and out 8 db at 55 MHz.
C. Audio-Frequency Conducted Susceptibility	No degradation of performance
D. Radio-Frequency Conducted Susceptibility	No degradation of performance
E. Radio-Frequency Radiated Susceptibility	No degradation of performance
F. Magnetic Field Induced into Equipment	No degradation of performance
G. Receiver Intermodulation	Intermodulation susceptibility had a threshold of 10 microvolts at the Defense Electronics, Inc. Receiver.

Reference: Appendix 4

2.2 Model DSV-4B-125, PAM/FM/FM Telemetry Ground Station

TEST REQUIREMENTS	TEST RESULTS
A. Conducted Interference	Conducted Broad Band Steady State was out 1 db maximum at one point near 1.2 MHz on the 400 Hz Neutral Line.
B. Radiated Interference	Radiated Broad Band Steady State was out 5.8 db maximum between 150 KHz and 335 KHz. Radiated Narrow Band was out 24 db maximum between 16 MHz and 270 MHz.
C. Audio-Frequency Conducted Susceptibility	No degradation of performance
D. Radio-Frequency Conducted Susceptibility	No degradation of performance
E. Radio-Frequency Radiated Susceptibility	No degradation of performance
F. Magnetic Field Induced into Equipment	No degradation of performance
G. Receiver Intermodulation	Did not produce any undesirable receiver response.

Reference :- Appendix 5

2.3 Model DSV-4B-126, Single-Sideband Ground Station

TEST REQUIREMENTS	TEST RESULTS
A. Conducted Interference	Conducted Interference was within specification limits.
B. Radiated Interference	Broad Band Radiated Interference was within specification limits. Narrow Band Radiated Interference was out 17 db at 16.5 MHz with the test equipment off and the console front doors closed (normal test operation). Narrow Band Radiated Interference (doors open) was out 10.4 db at 16 MHz and out 18 db at 48 MHz.
C. Audio-Frequency Conducted Susceptibility	No degradation of performance
D. Radio-Frequency Conducted Susceptibility	No degradation of performance
E. Radio-Frequency Radiated Susceptibility	No degradation of performance
F. Magnetic Field Induced into Equipment	No degradation of performance
G. Receiver Intermodulation	Intermodulation Susceptibility had a threshold of 10 microvolts at the test frequency of 300 MHz and 41.5 MHz.

Reference: Appendix 6

2.4 Model DSV-4B-127, Wideband Magnetic Tape Recorder

TEST REQUIREMENTS	TEST RESULTS
A. Conducted Interference	Conducted Broad Band Steady State was out 22 db maximum between 0.15 MHz and 25 MHz on the 115 VAC Input Power Lines. Conducted Narrow Band was out 28 db at 7 MHz on Input Power Line and 10 db out at 7 MHz on the Return Power Line.
B. Radiated Interference	Radiated Broad Band was out 22 db maximum between 0.15 MHz and 21 MHz. Radiated Narrow Band Signals generated by the unit's bias oscillator exceeded specfication limits by a maximum of 30 db in the frequency range of 7 MHz to 120 MHz.
C. Audio-Frequency Conducted Susceptibility	No degradation of performance
D. Radio-Frequency Conducted Susceptibility	No degradation of performance
E. Radio-Frequency Radiated Susceptibility	No degradation of performance
F. Magnetic Field Induced into Equipment	No degradation of performance

Reference: Appendix 7

2.5 Model DSV-4B-128, Frequency Calibration Unit

TEST REQUIREMENTS	TEST RESULTS
A. Conducted Interference	Broad Band Conducted Steady State Interference measured on the 115 VAC Power and Return Lines was out a maximum of 13 db over the frequency range of 300 KHz to 760 KHz. Narrow Band Conducted Interference was out a maximum of 5.5 db at 20 MHz on the Power Return Line.
B. Radiated Interference	Steady State Broad Band Radiated Interference was well within specification limits. Broad Band Radiated Transient Interference was within specification limits. Narrow Band Radiated Interference was out a maximum of 18.5 db over the frequency range of 150 KHz to 210 MHz.
C. Radio-Frequency Conducted Susceptibility	No degradation of performance
D. Radio-Frequency Radiated Susceptibility	No degradation of performance
E. Magnetic Field Induced into Equipment	No degradation of performance

Reference: Appendix 8

2.6 Model DSV-4B-136, Destruct System Test Set

TEST REQUIREMENTS	TEST RESULTS
A. Conducted Interference	Steady State Broad Band Conducted Interference was within specification. Narrow Band Conducted Interference was within specification except for 1 db out at 24.5 MHz measured on the 115 VAC Return Line.
B. Radiated Interference	Broad Band Radiated Interference was within specification. Narrow Band Radiated Interference was out a maximum of 30.5 db between the frequency range of 21 MHz and 210 MHz.
C. Audio-Frequency Conducted Susceptibility	No degradation of performance
D. Radio-Frequency Conducted Susceptibility	No degradation of performance
E. Radio-Frequency Radiated Susceptibility	No degradation of performance
F. Magnetic Field Induced into Equipment	No degradation of performance

Reference: Appendix 9

2.7 Model DSV-4B-296, Telemetry Signal Distribution Unit

TEST REQUIREMENTS	TEST RESULTS
A. Conducted Interference	Model met all interference and susceptibility requirements in the specification.
B. Radiated Interference	
C. Audio-Frequency Conducted Susceptibility	
D. Radio-Frequency Conducted Susceptibility	
E. Radio-Frequency Radiated Susceptibility	
F. Transient Conducted Susceptibility	
G. Magnetic Field Induced into Equipment	

Reference: Appendix 10

3.0 TEST RESULTS SUMMARY

3.1 DSV-4B-123

3.1.1 General

The Model DSV-4B-123, DDAS Ground Station, Part No. 1A59941-1, Figure 3-1, was tested per the EMC requirements of Drawing 1T02946. The actual laboratory test data, Figures 4-1 through 4-14, are summarized in this section and may be found in the Douglas Technical Memorandum, DSV4B-EE-R5240. The Technical Memorandum also includes a complete list of all test equipment used to perform the tests.

The Model DSV-4B-123 was loaded per Figure 2, Sheet 17 of Drawing 1T02946 so as to present a load equivalent to the peripheral equipment. The signal source was an FM Signal Generator modulated by a Digital Signal Simulator and fed directly to the Console so as to simultate vehicle data.

3.1.2 Results and Discussion

Broad Band Steady State Conducted Interference measured on the 28 VDC Input Power Lines exceeded specified limits a maximum of 6 db in the frequency range of 2.2 MHz to 18.0 MHz. (Figures 4-1 and 4-2)

Broad Band Steady State Conducted Interference measured on the 28 VDC Return Power Lines exceeded specified limits a maximum of 24 db in the frequency range of 1.2 MHz to 24.0 MHz. (Figures 4-3 and 4-4)

Steady State Broad Band Conducted Interference Test measured on the 115 VAC Input Power Line exceeded specified limits a maximum of 19 db in the frequency range of 260 KHz to 16.5 MHz. (Figure 4-5)

Steady State Broad Band Conducted Interference Test measured on the 115 VAC Return Power Line exceeded specified limits a maximum of 21 db in the frequency range of 300 KHz to 17.0 MHz. (Figure 4-6)

Evaluation of the above tests resulted in a redesign of the unit under test to include AC and DC Line Filters to suppress conducted interference. Following filter installation, a limited secondary EMI Test was performed at the System Integration Laboratory (SIL). Readings were made the same day with and without the filters. Some improvement in the overall

interference pattern was noted.

Broad Band Conducted Interference on the 28 VDC Input Line was reduced a maximum of 36 db between 1.5 KHz and 25.0 MHz with a signficant reduction over the entire band. (Figure 4-7)

Broad Band Conducted Interference on the 28 VDC Return Line was reduced a maximum of 28 db between 150 KHz and 25 MHz with a significant reduction over the entire band except for a 9 db increase between 2.1 MHz and 4.5 MHz. (Figure 4-8)

Broad Band Conducted Interference on the 115 VAC Power Input Line was reduced a maximum of 46 db between 15 KHz and 25 MHz with a significant reduction over the entire band except for a 3 db increase around 5.4 MHz. (Figure 4-9)

Broad Band Conducted Interference on the 115 VAC Return Line was reduced a maximum of 43 db between 150 KHz and 25 MHz with a significant reduction over the entire band.(Figure 4-10)

At SIL the EMI environment was completely uncontrolled. Direct correlation to original test data would be meaningless; however, the data obtained does show a definite improvement in the reduction of conducted interference.

Broad Band Radiated Interference was well within design limits for both open and closed doors. (Figures 4-11 and 4-12)

Narrow Band Radiated Interference exceeded design limits by a maximum fo 5 db with the doors closed and by a maximum of 23 db with the doors open. (Figures 4-13 and 4-14)

Radio-Frequency Conducted Susceptibility Test produced no detectable change in operation of the Console.

Audio-Frequency Conducted Susceptibility Test produced no detectable change in operation of the Console.

Radio-Frequency Radiated Susceptibility Test produced no detectable change in operation of the Console.

Magnetic Field Susceptibility Test produced no detectable change in operation of the Console.

Receiver Intermodulation Test on the UHF Telemetry Receiver results in very low level outputs as shown below:

Receiver #1 Frequency (MHz)	Generator #2 Frequency (MHz)	Receiver Signal Strength (Microvolts)
132.9	100	10
332.9	100	10
182.9	50	1
282.9	50	1

3.1.3 Conclusion

The Broad Band Conducted Interference Test performed at SIL with the line filters installed showed a significant overall improvement. If this improvement were related back to the initial test, all points would be below or near the specification limits. As a result of the SIL tests, all units were modified to incorporate AC and DC line filters.

Narrow Band Radiated Interference was slightly out-of-specification (6 db) and was considered acceptable. The majority of the Radiated Interference was created by the Telemetrics Power Supply which was a NASA directed buy and thus DACo had no control over its EMI specifications.

The intermodulation in the receiver was determined to be acceptable since the type and level of signals actually encountered is radically different than those signals used for the test.

3.2 DSV-4B-125

3.2.1 General

The Model DSV-4B-125, PAM/FM/FM Telemetry Station, Part No. 1A59942-1, Figure 3-2, was tested per EMC requirements of Drawing 1T07035. The actual laboratory test data, Figures 5-1 through 5-18, are summarized in the Douglas Technical Memorandum, DSV4B-EE-R5493. The Technical Memorandum also includes a complete list of all test equipment used to perform the tests.

The Model DSV-4B-125 was loaded as specified in the Douglas Test Control Drawing, 1T07035, Revision "B", so as to simulate actual operating conditions.

3.2.2 Results and Discussion

Narrow Band Steady State Conducted Interference was well within specified limits on all power lines. (Figures 5-1 through 5-8)

Broad Band Steady State Conducted Interference was within specified limits on all power lines except for the 115 VAC 400 Hz Return Line that was out 1 db at a frequency of 12 MHz. (Figures 5-9 through 5-16)

Narrow Band Radiated Interference exceeded specified limits a maximum of 24 db in the frequency range of 16 MHz to 270 MHz. (Figure 5-17)

Broad Band Radiated Interference exceeded specified limits a maximum of 6 db in the range of 150 KHz to 330 KHz. It also exceeded design limits by 1 db at a frequency of 35 MHz. (Figure 5-18)

Audio-Frequency Conducted Susceptibility Test produced no degradation in performance of the Console.

Radio-Frequency Conducted Susceptibility Test produced no degradation in performance of the Console.

Radio-Frequency Radiated Susceptibility Test produced no degradation in performance of the Console.

Magnetic Field Susceptibility Test produced no degradation in performance of the Console.

There were no undesirable responses to the receiver intermodulation tests.

3.2.3 Conclusion

The 1 db out-of-specification condition during Broad Band Conducted Interference is well within the allowed 3 db measurement error.

Broad Band Radiated Interference which exceeded design limits by a maximum of 6 db was acceptable since the slight improvement to be gained by modification of the Console would not have warrented the high cost of modification.

The out-of-specification condition during the Narrow Band Radiated Interference Test was due primarily to the Telemetry Receiver and Frequency Counter as shown in Figure 5-17. Both the Receiver and the Counter had been modified so as to reduce radiated interference

to a minimum without extensive redesign of the internal circuits. Any further modification would have been too costly with respect to the small amount of improvement that could have been obtained. For these reasons the out-of-specification condition was determined to be acceptable.

3.3 DSV-4B-126

3.3.1 General

The Model DSV-4B-126, SSB/FM Telemetry Station, Part No. 1A59943-1, Figure 3-3, was tested per the EMC requirements of Drawing 1T07770. The actual laboratory test data, Figures 6-1 through 6-17, are summarized in this section and may be found in the Douglas Technical Memorandum, DSV4B-EE-R5149. The Technical Memorandum also includes a complete list of all test equipment used to perform the tests.

The Model DSV-4B-126 was loaded per Drawing 1T07770, Figure 2, Sheet 13, so as to simulate actual operational loading.

3.3.2 Results and Discussion

Broad Band Conducted Interference measured on all input lines was well within the specified limits. (Figures 6-1 through 6-6)

Narrow Band Conducted Interference measured on all input lines was well within the specified limits. (Figures 6-7 through 6-12)

Broad Band Radiated Interference measurements were well within specified limits. (Figures 6-13 through 6-14)

Narrow Band Radiated Interference measurements exceeded specified limits a maximum of 18 db in the frequency range of 180 KHz to 48 MHz as measured with all the equipment on and Console doors open. (Figure 6-15)

Narrow Band Radiated Interference measurements exceeded specified limits a maximum of 17 db in the frequency range of 230 KHz to 19 MHz as measured with the receiver and demultiplexer on and Console doors open. (Figure 6-16)

Narrow Band Radiated Interference measurement exceeded specified limits a maximum of 17 db in the frequency range of 11 MHz to 19 MHz as measured with the receiver and demultiplexer on and Console doors closed. (Figure 6-17)

Receiver Intermodulation Test on the Nems-Clarke Receiver produced a maximum signal strength of 10 microvolts at the test frequencies of 300 MHz and 41.5 MHz.

Radio-Frequency Conducted Susceptibility Test produced no degradation in the operation of the Console.

Audio-Frequency Conducted Susceptibility Test produced no degradation in the operation of the Console.

Transient Conducted Susceptibility Test produced no degradation in the operation of the Console.

Radio-Frequency Radiated Susceptibility Test produced no degradation in the operation of the Console.

Magnetic Field Susceptibility Test produced no degradation in the operation of the Console.

3.3.3 Conclusion

Narrow Band Radiated Interference which exceeded specified limits was due to the Nems-Clarke Receiver and the demultiplexer. The demultiplexer was a government directed buy over which we had very little control. The Nems-Clarke Receiver had been modified as much as possible to reduce radiated interference. Any further reduction would have resulted in modification of the basic circuits. This modification would have been too costly for the slight improvement which could have been gained. For these reasons the radiated interference was determined to be acceptable and no corrective action was taken.

The slight amount of receiver intermodulation was considered to be negligible when compared to signal strength and frequencies encountered during actual operation.

3.4 DSV-4B-127

3.4.1 General

The Model DSV-4B-127, Wideband Magnetic Tape Recorder, Part No. 1A77890-1, Figure 3-4, was tested per the EMC requirements of Drawing 1T02922. The actual laboratory test data, Figures 7-1 through 7-11, are summarized in this section and may be found in the Douglas Technical Memorandum,

DSV4B-EE-R4874. The Technical Memorandum also includes a complete list of all test equipment used to perform the tests.

The Model DSV-4B-127 was loaded using 75 ohm loads on the outputs. These outputs were monitored by oscilloscopes. The signal inputs were signals generators. The test setup connection can be found on Sheets 13 and 14, Figures 3 and 4 of Drawing 1T02922.

3.4.2 Results and Discussion

Broad Band Conducted Interference measured on the 115 VAC 60 Hz Input Power Line with no filter exceeded the specified limits a maximum of 21 db in the frequency range of 200 KHz to 30 MHz. With line filters installed the measured interference was well within specified limits. (Figures 7-1 and 7-2)

Broad Band Conducted Interference measured on the 115 VAC 60 Hz Return Line with no filter exceeded specified limits a maximum of 7 db in the frequency range of 1.6 MHz to 6.0 MHz. With the line filters installed the interference was well within specified limits. (Figures 7-3 and 7-4)

Broad Band Conducted Interference measured on the 115 VAC 60 Hz Neutral Line with no filter exceeded the specified limits a maximum of 24 db in the frequency range of 150 KHz to 25 MHz. With line filters installed the interference was well within specified limits. (Figures 7-5 and 7-6)

Narrow Band Conducted Interference measured on the 115 VAC 60 Hz Input and Return Lines exceeded the specified limits a maximum of 14 db at a frequency of 7 MHz. The Neutral Line was within the specified limits. (Figure 7-7)

Broad Band Radiated Interference measured without line filters exceeded the specified limits a maximum of 22 db in the frequency range of 150 KHz to 22 MHz. With the filters installed interference was reduced to a maximum of 7 db in the frequency range of 160 KHz to 580 KHz. (Figures 7-8 and 7-9)

Narrow Band Radiated Interference, both with and without line filters, exceeded the specified limits a maximum of 43 db in the frequency range of 7 MHz to 130 MHz. (Figures 7-10 and 7-11)

Radio-Frequency Conducted Susceptibility Test produced no degradation in the operation of the Console.

Audio-Frequency Conducted Susceptibility Test produced no degradation in the operation of the Console.

Radio-Frequency Radiated Susceptibility Test produced no degradation in the operation of the Console.

Magnetic Field Susceptibility Test produced no degradation in the operation of the Console.

3.4.3 Conclusion

The excess radiated and conducted interference observed during the EMI tests of the Wideband Tape Recorder was determined to be acceptable for the following reasons:

1. The tape transport and amplifiers were purchased as an entire console and all modification work would have to be performed by the vendor.
2. Negotiations to procure an EMI kit to modify the tape recorder console proved that the kits were not available and the cost to fabricate and install such a kit would be prohibitive.

3.5 DSV-4B-128

3.5.1 General

The Model DSV-4B-128, Frequency Calbiration Unit, Part No. 1A72909-1, Figure 3-5, was tested per the EMC requirements of Drawing 1T02947. The actual laboratory test data, Figures 8-1 through 8-7, are summarized in this section and may be found in the Douglas Technical Memorandum, DSV4B-EE-R4992. The Technical Memorandum also includes a complete list of all test equipment used to perform the tests.

The Model DSV-4B-128 was loaded so as to simulate an actual receiver by using a 50 ohm coaxial termination. A counter was attached to this line to monitor the internal signal generator. An external signal generator supplied the 30 MHz signal normally supplied by the receiver under test.

3.5.2 Results and Discussion

Broad Band Conducted Interference measured on the 115 VAC Input Power Line exceeded design limits a maximum of 13 db between 280 KHz and 800 KHz. (Figure 8-1)

Broad Band Conducted Interference measured on the 115 VAC Return Power Line exceeded design limits a maximum of 13 db between 280 KHz and 820 KHz. (Figure 8-2)

Narrow Band Conducted Interference measured on the 115 VAC Input Power Lines was within specified limits. (Figure 8-3)

Narrow Band Conducted Interference measured on the 115 VAC Return Line exceeded design limits by 5.5 db at a frequency of 20 MHz. (Figure 8-4)

Steady State Broad Band Radiated Interference was within design limits. (Figure 8-5)

Transient Broad Band Radiated Interference was well within design limits. (Figure 8-6)

Narrow Band Radiated Interference exceeded design limits by a maximum of 18 db in the frequency range of 150 KHz to 210 MHz. (Figure 8-7)

Radio-Frequency Conducted Susceptibility Test produced no degradation of performance of the Console.

Radio-Frequency Radiated Susceptibility Test produced no degradation of performance of the Console.

Magnetic Field Susceptibility Test produced no degradation of performance of the Console.

3.5.3 Conclusion

The slight amount of Broad Band Conducted Interference (5.5 db) measured on both the Input and Return 115 VAC Lines was acceptable because the cost of modification would not have warrented the slight improvement which would have been gained.

The slight out-of-specification condition observed during the Narrow Band Conducted Interference test was acceptable since the high cost of modification would not have been justified by the small improvement which would have been gained.

The Narrow Band Radiated Interference was due to the Hewlett-Packard Counter, an off-the-shelf vendor part, which was modified as much as possible to reduce radiation to a minimum without redesigning the entire package. The cost of further modification would have been too high for the slight improvement which would have been gained. For this reason the interference was acceptable.

3.6 DSV-4B-136

3.6.1 General

The Model DSV-4B-136, Destruct System Test Set, Part No. 1A59952-1, Figure 3-6, was tested per the EMC requirements of Drawing 1T07527. The actual laboratory test data, Figures 9-1 through 9-6, are summarized in this section and may be found in the Douglas Technical Memorandum, DSV4B-EE-R5550. The Technical Memorandum also includes a complete list of all test equipment used to perform the tests.

The Model DSV-4B-136, coded RF closed loop output was loaded by a 50 ohm load simulating vehicle loading. An oscilloscope was connected to the command test coder 75 ohm output.

3.6.2 Results and Discussion

Broad Band Steady State Conducted Interference was within specified limits. (Figures 9-1 through 9-2)

Broad Band Radiated Interference was within specified limits. (Figure 9-3)

Narrow Band Conducted Interference on the 115 VAC Return Line exceeded design limits by 1 db at a frequency of 24.5 MHz. (Figure 9-4)

Narrow Band Conducted Interference measured on the 115 VAC Input Power Line was within specified limits. (Figure 9-5)

Narrow Band Radiated Interference exceeded design limits by a maximum of 30.5 db over the frequency range of 21 MHz to 210 MHz. (Figure 9-6)

Radio-Frequency Conducted Susceptibility Test resulted in no detectable change in operation of the Console.

Audio-Frequency Conducted Susceptibility Test resulted in no detectable change in operation of the Console.

3.6.3 Conclusion

The 1 db out-of-specification condition during the Narrow Band Conducted Interference Test on the 115 VAC Return Line was well within the allowed 3 db measurement error which can occur during testing operations.

The Narrow Band Radiated Interference Test results are considered to be acceptable. These signals were generated primarily by the AVCO Command Test Coder Assembly. The Coder being a government furnished part could not be modified so as to meet the EMI requirements.

3.7 DSV-4B-296

3.7.1 General

The Model DSV-4B-296, Telemetry Signal Distribution Unit, Part No. 1B41812-1, Figure 3-7, was tested per the EMC requirements of Drawing 1T08803. The actual laboratory test data, Figures 10-1 through 10-6, are summarized in this section and may be found in the Douglas Technical Memorandum, DSV4B-EE-R5241. The Technical Memorandum also includes a complete list of all test equipment used in the tests.

The Model DSV-4B-296 was loaded with a counter and an oscilloscope which was connected across a two hundred ohm (200 ohm) load, simulating vehicle loading. The signal source was a square wave generator simulating the vehicle's No. 3 PAM composite signal.

3.7.2 Results and Discussion

Broad Band Steady State Conducted Interference was well within specified limits. (Figures 10-1 through 10-4)

Broad Band Steady State Radiated Interference was well within specified limits. (Figures 10-5 and 10-6)

Narrow Band Radiated Interference was well within specified limits.

Radio-Frequency Conducted Susceptibility resulted in no detectable change in operation of the Console.

Audio-Frequency Conducted Susceptibility resulted in no detectable change in operation of the Console.

Radio-Frequency Conducted Susceptibility resulted in no detectable change in operation of the Console.

Transient Conducted Susceptibility resulted in no detectable change in operation of the Console.

Magnetic Susceptibility resulted in no detectable change in operation of the Console.

3.7.3 Conclusion

All test requirements were met.

APPENDIX 1

TEST CONDITIONS

Each model was tested inside a shielded enclosure having a minimum attenuation of 85 db. The unit was placed on a ground plane and bonded using the ground pin of the primary power connection. Line stabilization networks were placed in all primary power lines external to the Console.

In general, each model was externally loaded to provide operating conditions which were felt by the responsible design engineer to be typical of normal operations for that model. Specific loading for any model may be found in Appendices 4 through 10 applicable to that model.

TEST PROCEDURES

Conducted Interference Tests

Conducted Interference tests were performed in accordance with Douglas specification, 7883817, Paragraphs 4.3.1 and 4.3.1.1. Measurements were made in the frequency range of 0.15 to 25 MHz to verify that the model under test generated no excessive radio-frequency voltage on any external conductor. The readings were taken at the noise meter terminal on the line stabilization networks.

Radiated Interference Tests

Radiated Interference tests were performed in accordance with Douglas specification, 7883817, Paragraph 4.3.2. Measurements were made in the frequency range of 0.15 to 10,000 MHz to verify that the model under test radiated no excessive interference fields from any unit, cable, or interconnecting wiring. In those cases where no appreciable field was found in the region of 1,000 MHz, the requirements for tests from 1,000 MHz to 10,000 MHz was waived.

Audio-Frequency Conducted Susceptibility Tests

Audio Susceptibility tests were performed in accordance with Douglas specification, 7883817, Paragraph 4.3.4.1.2. Sine wave signals of 3 volts rms throughout the frequency range of 50 Hz to 15,000 Hz were superimposed on the primary power input lines of the unit under test to verify that no degradation of performance was produced.

Radio-Frequency Conducted Susceptibility Tests

Conducted Radio-Frequency Susceptibility tests were performed in accordance with Douglas specification, 7883817, Paragraph 4.3.4.1.1. RF signals of 100,000 microvolts were applied to the noise meter terminal of the line stabilization networks to verify that no degradation of performance was produced. The imposed signals were modulated 30 per cent at 400 Hz or 1,000 Hz over the frequency range of 0.15 MHz to 10,000 MHz. In those cases where no appreciable field was found in the region of 1,000 Hz, the requirements for tests from 1,000 MHz to 10,000 MHz was waived.

Radio-Frequency Radiated Susceptibility Tests

Radiated Radio-Frequency Susceptibility tests were performed in accordance with Douglas specification, 7883817, Paragraph 4.3.4.2. A radiating antenna was placed approximately five feet (5') to the rear of each Console to verify that no degradation in equipment performance was caused by radio-frequency interference fields. The input signal to the radiating antenna was 100,000 microvolts at frequencies from 0.15 MHz to 10,000 MHz.

Transient Conducted Susceptibility Tests

Transient Conducted Susceptibility tests were performed, where applicable, in accordance with Douglas specification, 7883817, Paragraph 4.3.4.1.3. Tests were made to verify that no damage to the equipment resulted from a 50 volt, 10 microsecond duration, 10 pulse per second, positive pulse imposed on the nominal 28 VDC supply lines. This test is not applicable to any of the models which operate solely from AC primary power.

Receiver Intermodulation Tests

Receiver Intermodulation tests were performed, where applicable, in accordance with Douglas specification, 7883817, Paragraph 4.3.4.3.1. Each receiver was subjected to two (2) undesired signals coupled to the input, one signal modulated 30 per cent with a 1,000 Hz signal and the other modulated 30 per cent with a 400 Hz signal. The frequencies chosen were such that their sum or difference was equal to the test frequency and such that neither gave an output when applied alone.

Magnetic Fields Induced into Cables

Magnetic fields were induced into interconnecting cables in accordance with Douglas specification, 7883817, Paragraph 4.3.4.5. Tests were performed to verify that no equipment performance degradation was caused by a magnetic field equivalent to that caused by a wire carrying 15 amperes at 400 Hz spaced 2 inches (2") away from cable under test. Tests were made with the wire oriented in two angular positions, 90 degrees apart, about the cable under test.

Magnetic Fields Induced into Equipment

Magnetic fields were induced into each model in accordance with Douglas specification, 7883817, Paragraph 4.3.4.6. Tests were performed to verify that no equipment performance degradation was caused by an ambient magnetiv field of 0.13 gauss rms at 400 Hz. The field was generated by a wire segment on foot (1') from the periphery of the Console carrying 20 amperes of current and extending two feet (2') beyond the Console at each end.

Model No.	Douglas Dwg. No.	Vendor & Model or Part No.	Nomenclature
-123		Brown Engineering Company	
	1A66514	Part No. 11105	Source Selector
	1A66518	Part No. 50M01731	Signal Simulator
		Part No. 50M01730	Quick Look
		Part No. 50M01720	Correlator
		Part No. 50M01700	Data Control
		Part No. 50M01762	Data Switch
		Part No. 50M03901	Data Register
		Douglas Aircraft Company	
	1B32900	Part No. 1B32900-1	Logic Power Supply
	1A88249	Part No. 1A88249-1	Computer Interface
	1A66516	Part No. 1A66516-1	Discrete Drawer
	1A59832	Part No. 1A59832-1	RF Switch Assembly
		Defense Electronics	
	1A66511	Model TMR-2A (1)	Receiver Demodulator
		Model PDC-B2 (600)	Playback Converter
		Harrison Laboratories	
	1A77417	Model HB103-105A	DC Power Supply
		Hewlett-Packard Company	
	1A65927	Model 175A	Oscilloscope
		Telemetrics	
	1A66507	Model 6303	Digital Data Synchronizer
	1A66519	Model DPS-6305	Logic Power Supply
	1A72709	Model 6210-1	Digital to Analog Converter
	1A72710	Model 6206-2	Calibrator D to A Converter
-125		Arnoux Corporation	
	1A65921	Model TDS300	Decommutation System
		Model EPS-2D	Electronic Power Supply
		Model DGG-10D	Gate Generator
		Model DPS-15D	Pulse Selector
		Model DGR-1D	Gate Rack
		Model DGAD-3D	Dual Gate Assembly
		Model SSP-1D	Sync Panel
		Model MS-1D	Monitor Scope
		Model MSP-1D	Monitor Scope Power Supply
		Model TCS-4D	T/M Commutator Simulator
		Model TSS-2D	Sub-Commutator Simulator
		Model DLD-3D	Decommutator Level Detector
		Model DPL-2D	Decommutator Pulse Intensifier
		Astrodata	
	1A68128	Model 3000	Analog-Digital Converter

-125		Computer Measurements Company	
	1A70949	Model 2720A-706B	Frequency Period Counter
		Data-Control Systems, Inc.	
	1A65920	Model GFD-3	Discriminator
	1A65919	Model GFD-5	Discriminator
	1A70907	Model GTC-3	Tape Speed Compensation Unit
	1A70906	Model GTC-5	Tape Speed Compensation Unit
	1A59653	Model GRO-4	Reference Oscillator-Mixer
	1A67499	Model GSA-1	Line Driving Amplifier
	1A65924	Model GSI-1B	VTVM Amplifier
		John Fluke Manufacturing	
	1A65925	Model 801 BR/AL	Differential Voltmeter
		Harrison Laboratories	
	1A77417	Model 510A	Power Supply
		Hewlett-Packard Company	
	1A65923	Model 204B	Oscillator
	1A65923	Model 403B	AC Voltmeter
	1A65927	Model 175A	Oscilloscope
	1A65927	Model 1750A	Dual Trace Vertical Amplifier
	1A65927	Model 1781B	Sweep Delay Generator
		Singer Metrics	
	1A70860	Model TMC-411E	Simultaneous Eleven Point Cal.
	1A70868	Model TMI-1b/120	Telemetering Indicator
	1A70868	Model TMP-1b	Telemetering Power Supply
		Vitro Electronics	
	1A58843	Model R-1037A-Z2	Telemetry Receiver
		Model RFT-101A	RF Tuner
		Model FSD-102A	Foster-Seeley Demodulator
		Model FSD-104A	Foster-Seeley Demodulator
		Model FSD-105A	Foster-Seeley Demodulator
		Model FSD-106B	Foster-Seeley Demodulator
	1A70948	Model MC-101	Nuvistor Multicoupler
-126		Airpax Electronics, Inc.	
	1B29275	Model FSD-30	Discriminator
		Dynatronics	
	1A74643	Model 5091-1	SSB Demultiplexer
		Harrison Laboratories	
	1A78132	Model HB101/802B	Dual 36 VDC Power Supply

-126		Hewlett-Packard Company	
		Model C-130	Oscilloscope
		Model 310A	Frequency Selective Voltmeter
		Model 403B	AC Voltmeter
		Model 204B	Oscillator
		Model 5232A	Counter
		Vitro Electronics	
	1A58843	Model R-1037A-Z2	Telemetry Receiver
		Model RFT-101A	RF Tuner
		Model FSD-102A.	Foster-Seeley Demodulator
		Model FSD-104A	Foster-Seeley Demodulator
		Model FSD-105A	Foster-Seeley Demodulator
		Model FSD-106B	Foster-Seeley Demodulator
-127		Consolidated Electrodynamics	
	1A77890	Model VR-3600	Wideband Tape Recorder
-128		Booton	
	1A74679	Model 202J	Signal Generator
		Douglas Aircraft Company	
	1A74902	Part No. 1A74902-1	Band Pass Amplifier 30 MHz
		Hewlett-Packard Company	
	1A59835	Model 5245L	Electronic Counter
		Vitro Electronics	
	1A59833	Model SDV-200-3DG	Pamoramic Display Unit
-136		AVCO Corporation	
		Part No. 331576-1	Test Coder
		Babcock Electronics	
	1A79015	Model BCC-6H	Audio Coder
		Microdot, Inc.	
	D858-0025	Model 412A	FM Signal Generator
-296		Benrus	
	1A41815	SF (Series)	Fixed Oscillator
		Dynamics Instrumentation	
	1B41813	Model 6283	Wideband Amplifier
		Harrison Laboratories	
	1A77417	Model 510A	DC Power Supply
		International Data Systems	
	1A66072	Model 60-14	Sweep Oscillator
		Sierra Electronics	
	1A84057	Model 160-50D-1	Dummy Load
		Model 160-50D-2	Dummy Load

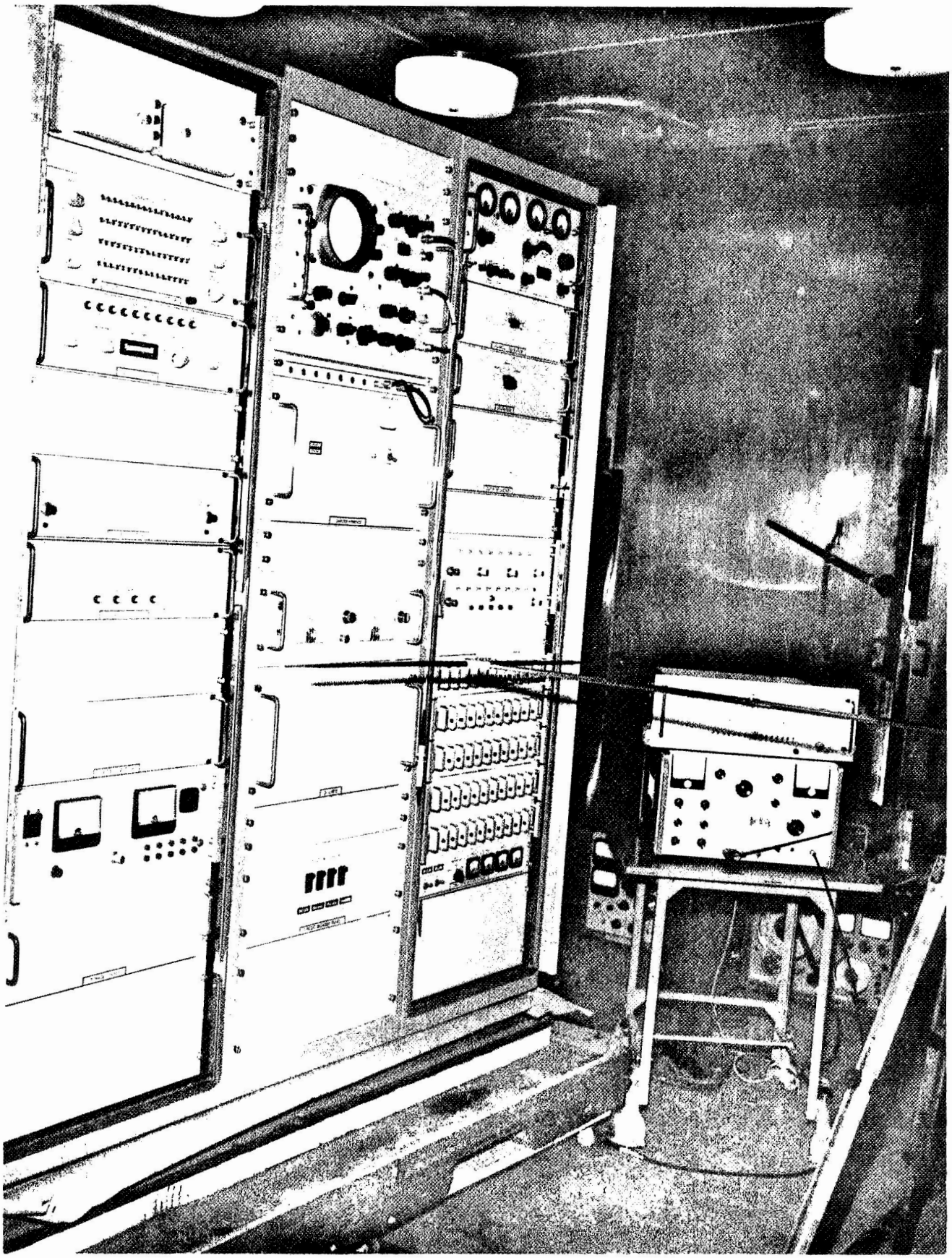

Figure 3–1. Model DSV–4B–123, DAS Ground Station

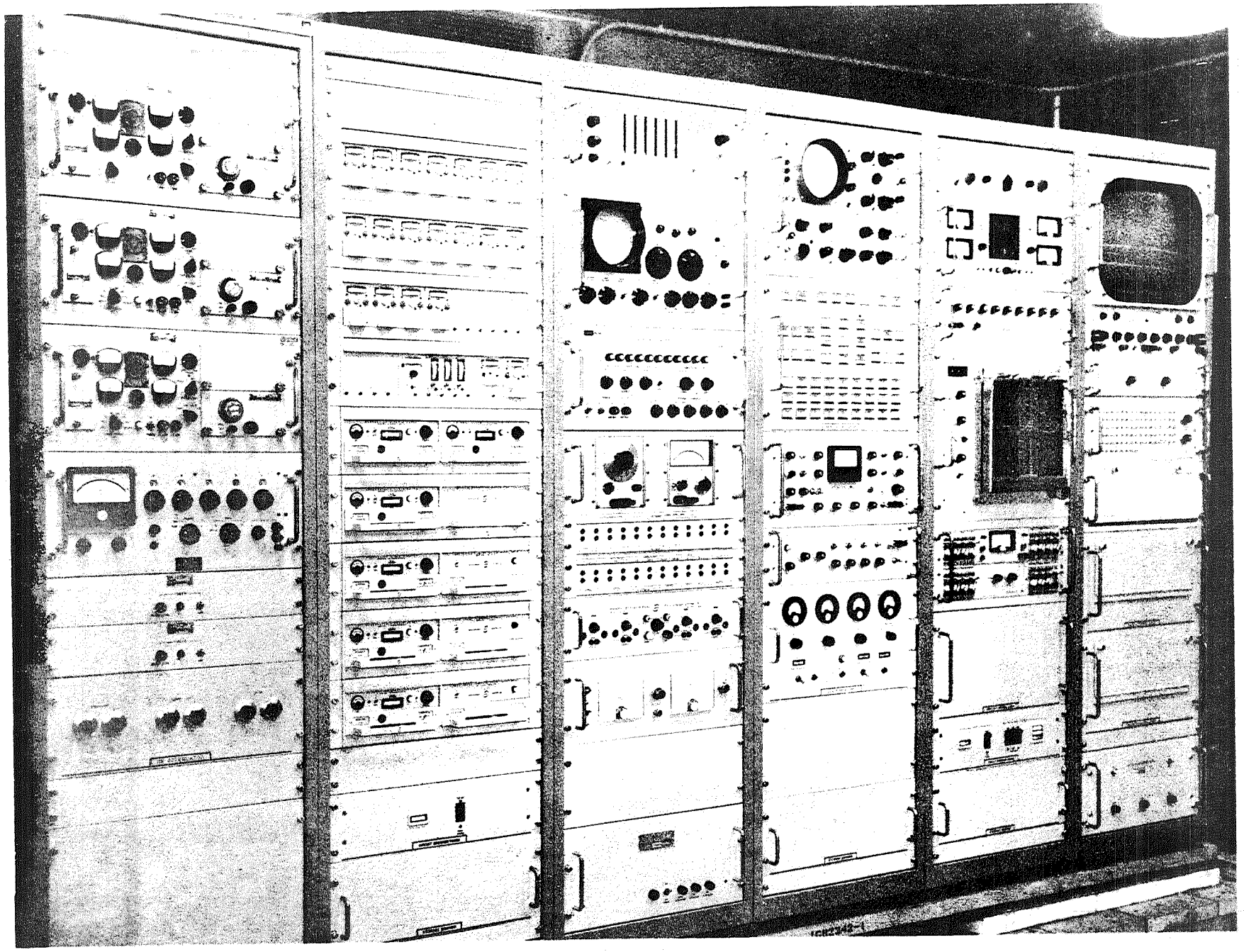

Figure 3–2. Model DSV–4B–125, PAM/FM/FM Telemetry Station

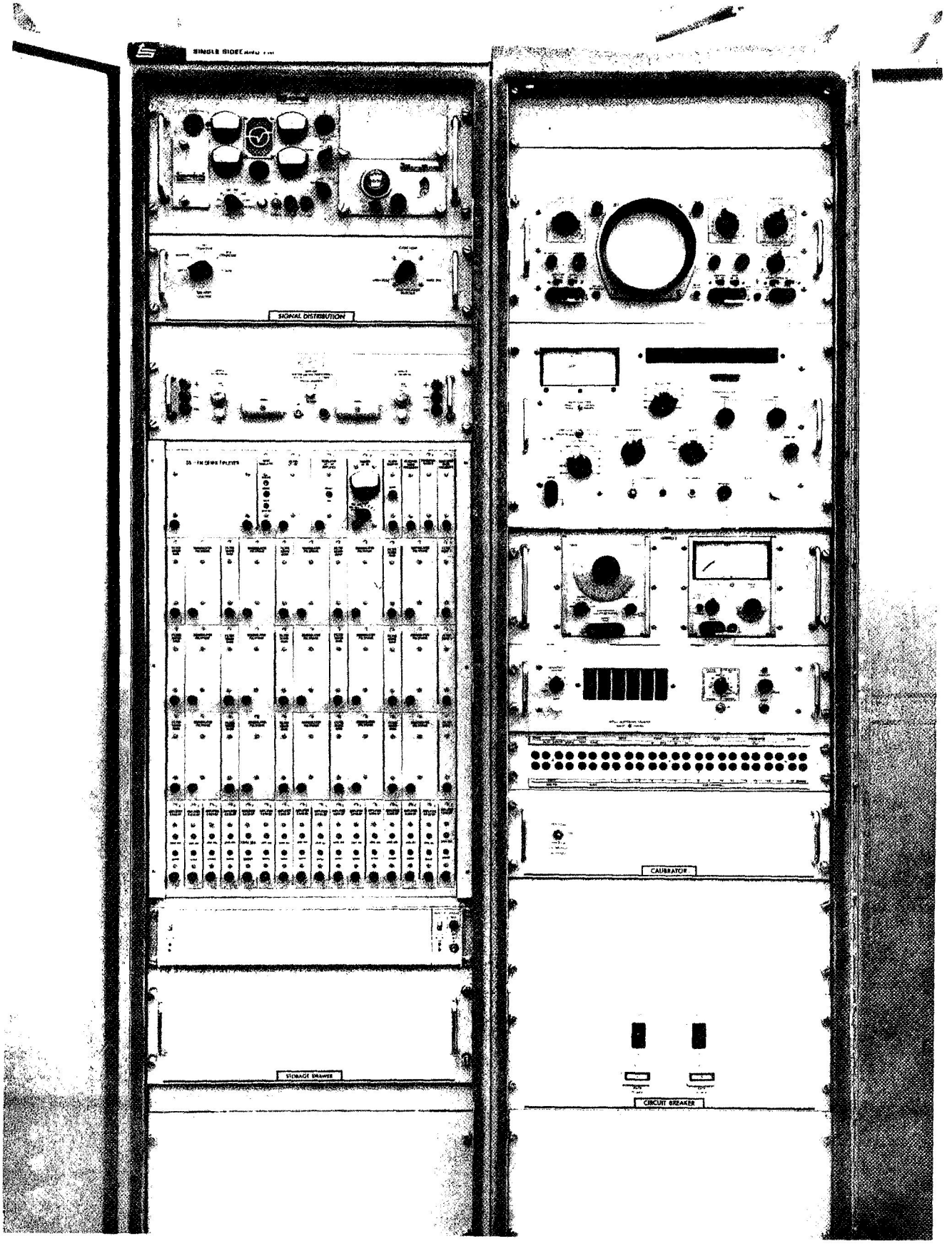

Figure 3–3. Model DSV–4B–126, SSB/FM Telemetry Station

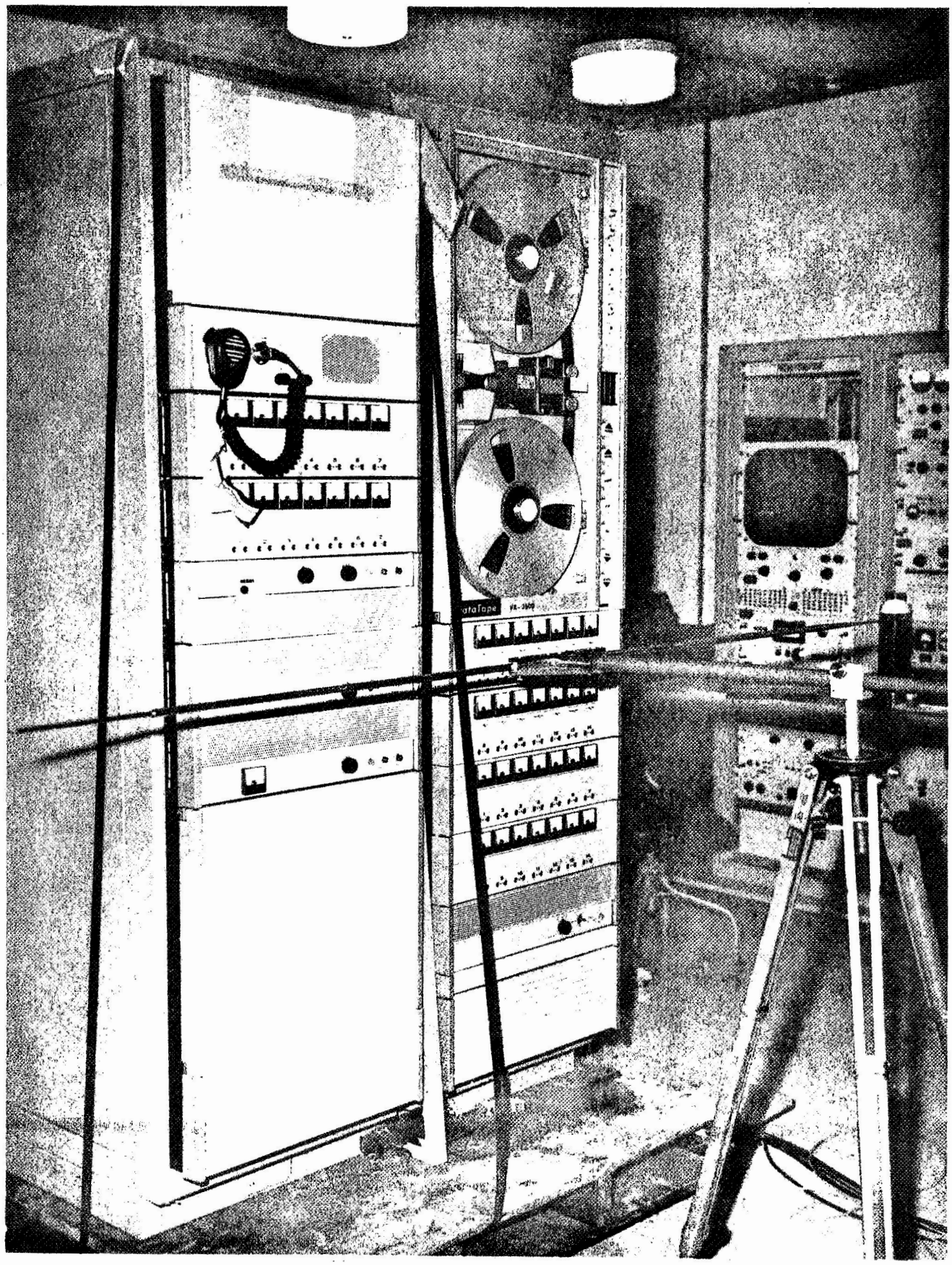

Figure 3–4. Model DSV–4B–127, Wideband Magnetic Tape Recorder

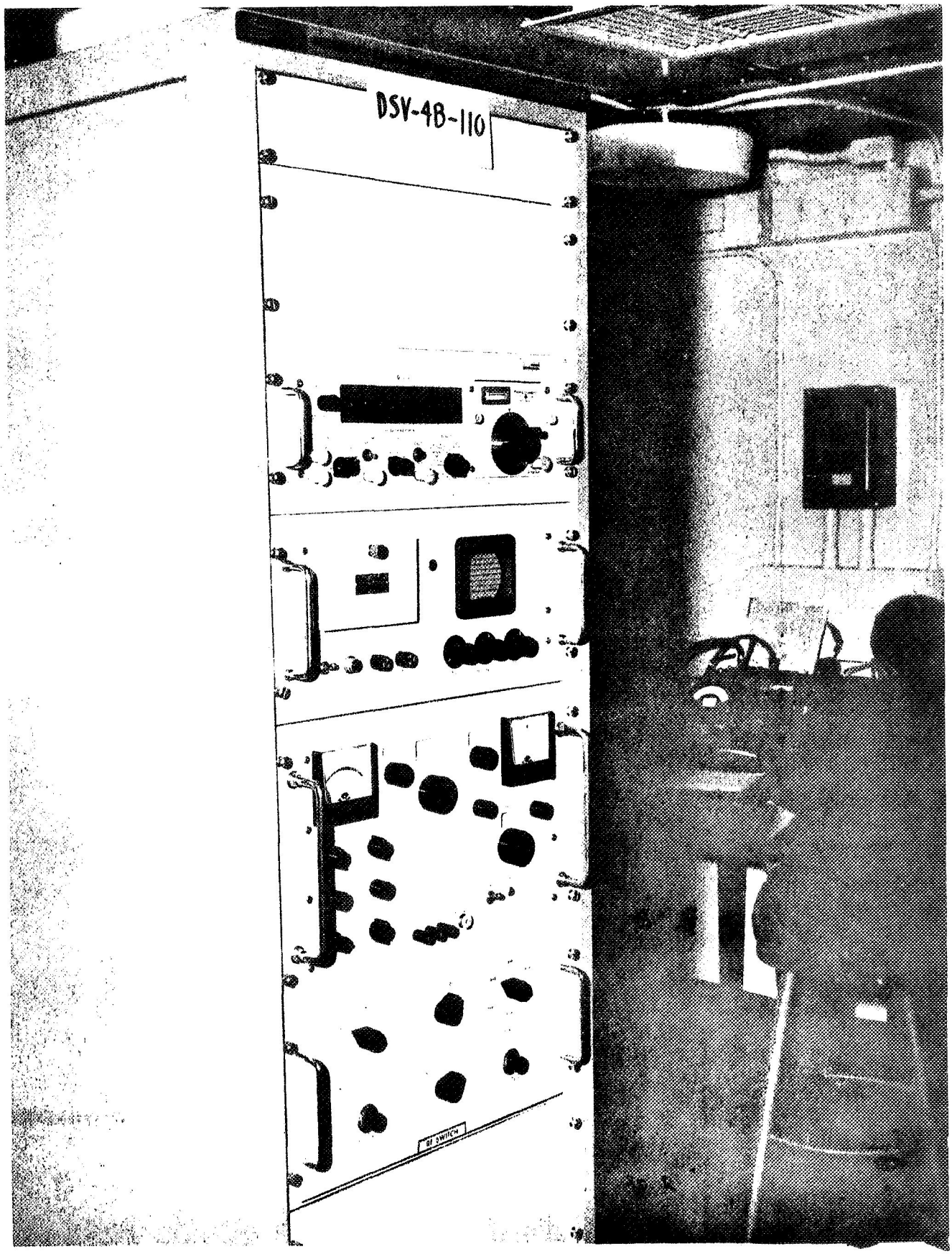

Figure 3-5. Model DSV-4B-128, Frequency Calibration Unit

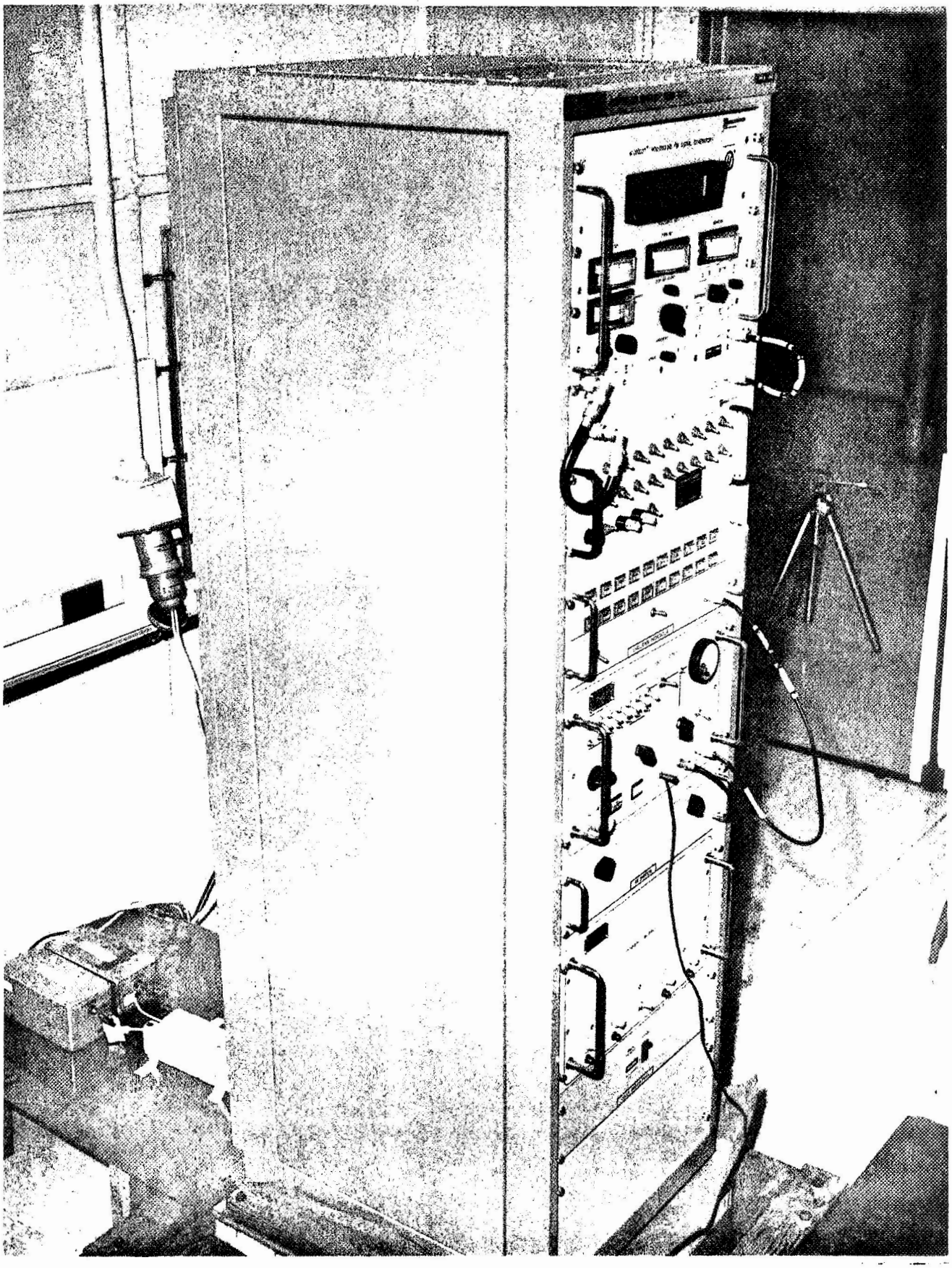

Figure 3–6. Model DSV–4B–136, Destruct System Test Set

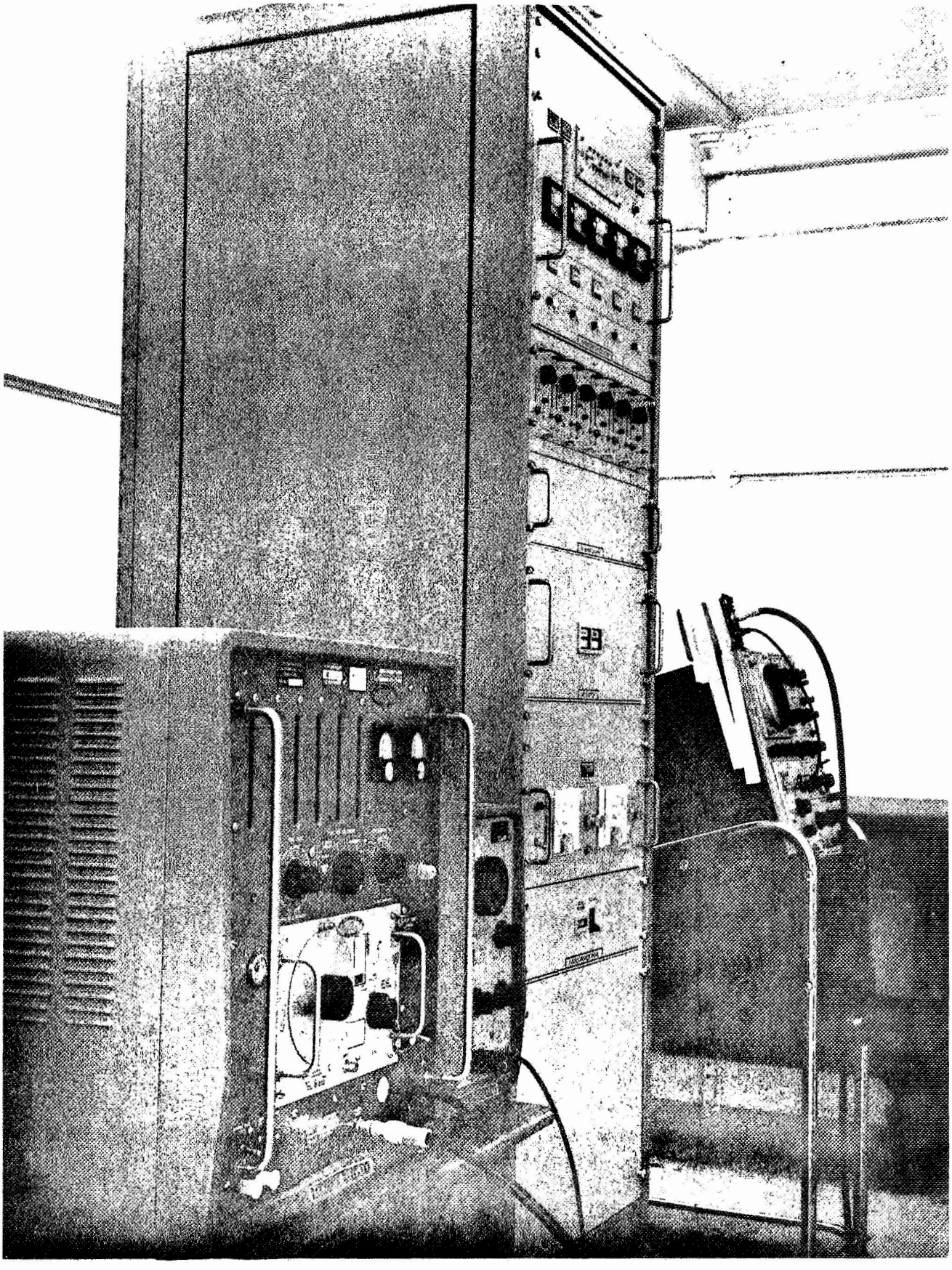

Figure 3–7. Model DSV–4B–296, Telemetry Signal Distribution Unit

APPENDIX 4

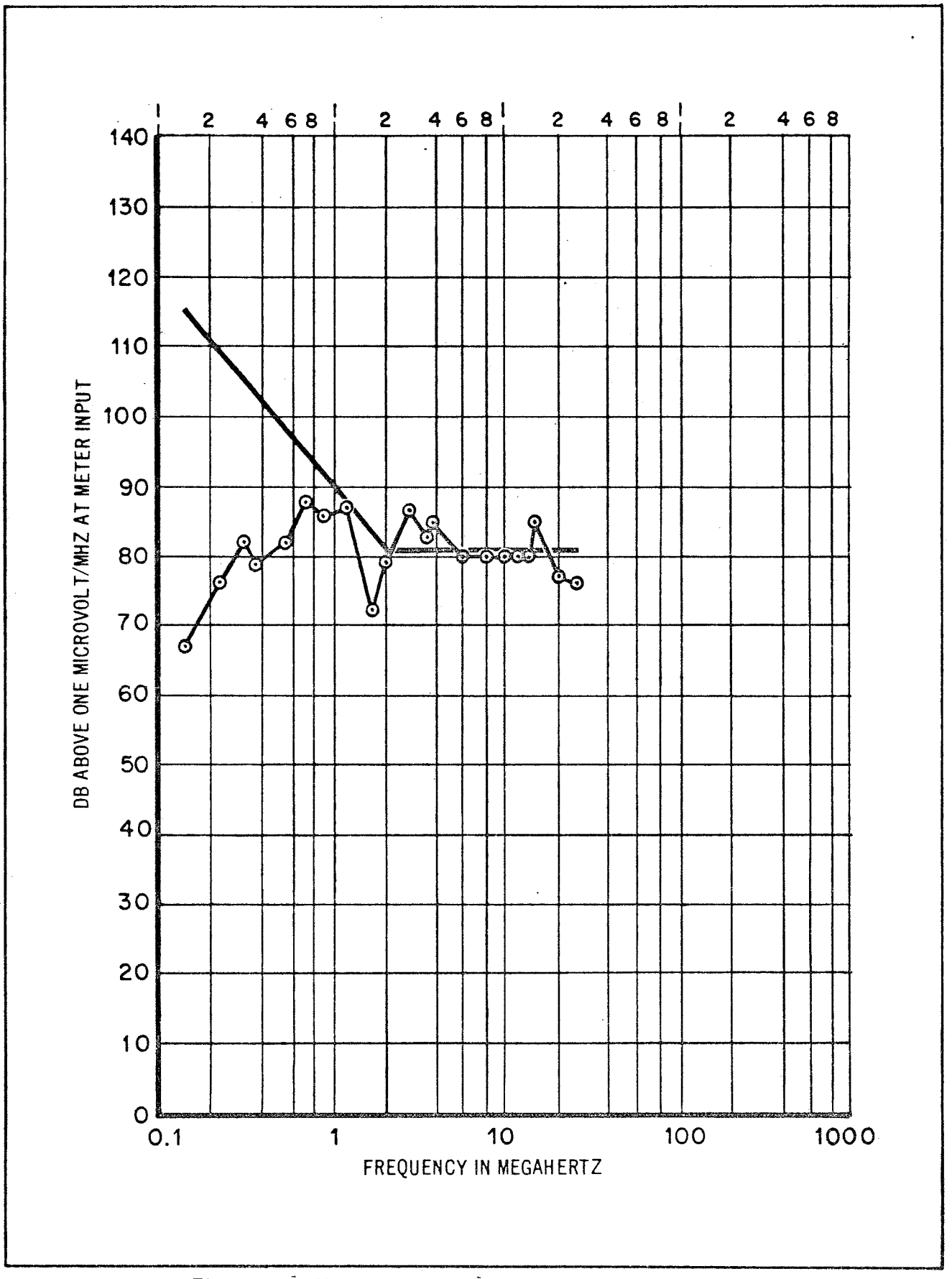

Figure 4–1. Model DSV–4B–123 Test Results
Broad Band Conducted Interference, J3 (Pin "C"),
28 VDC Input Power Line

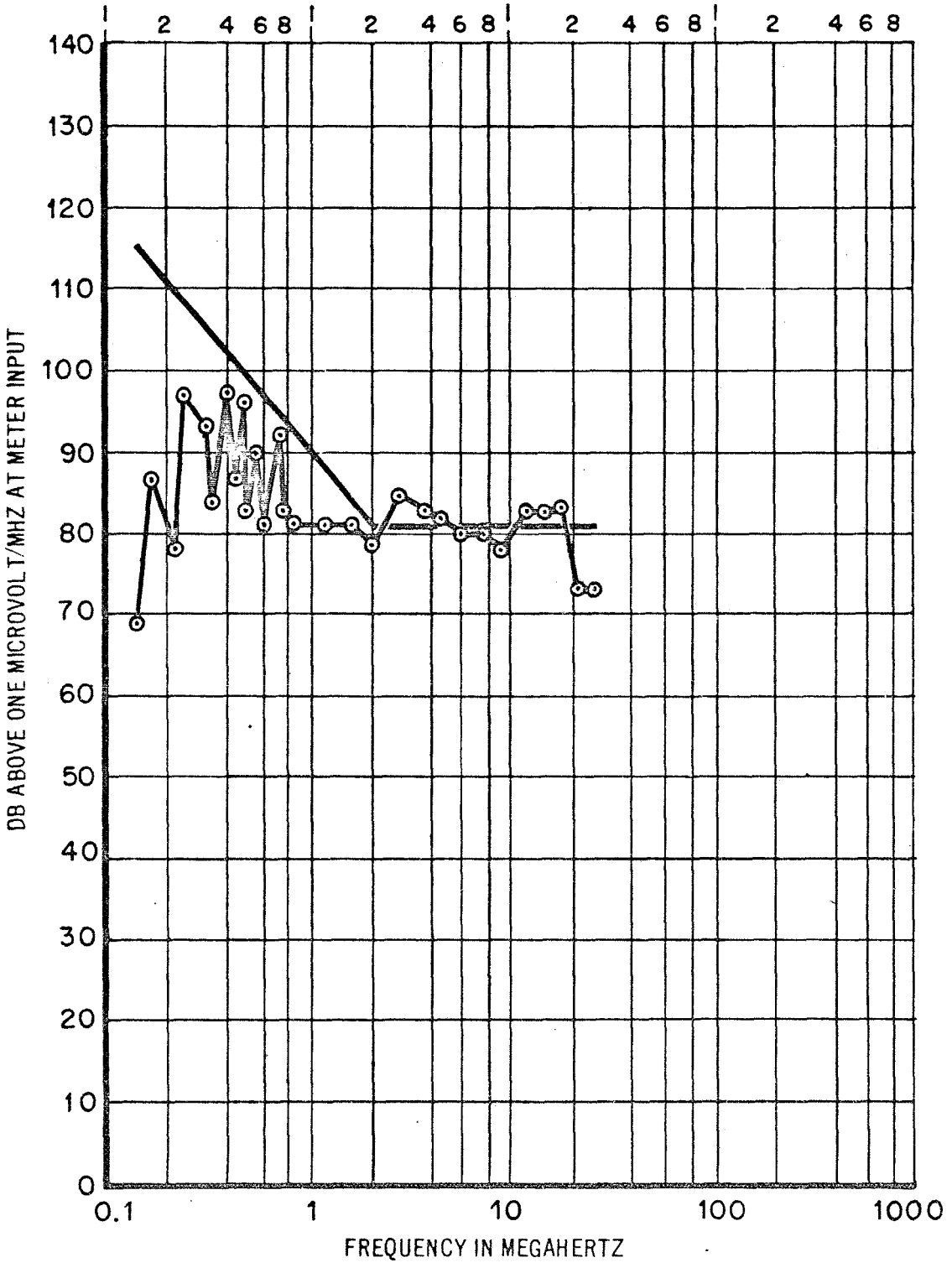

Figure 4–2. Model DSV–4B–123 Test Results
Broad Band Conducted Interference, J3 (Pin "D"),
28 VDC Input Power Line

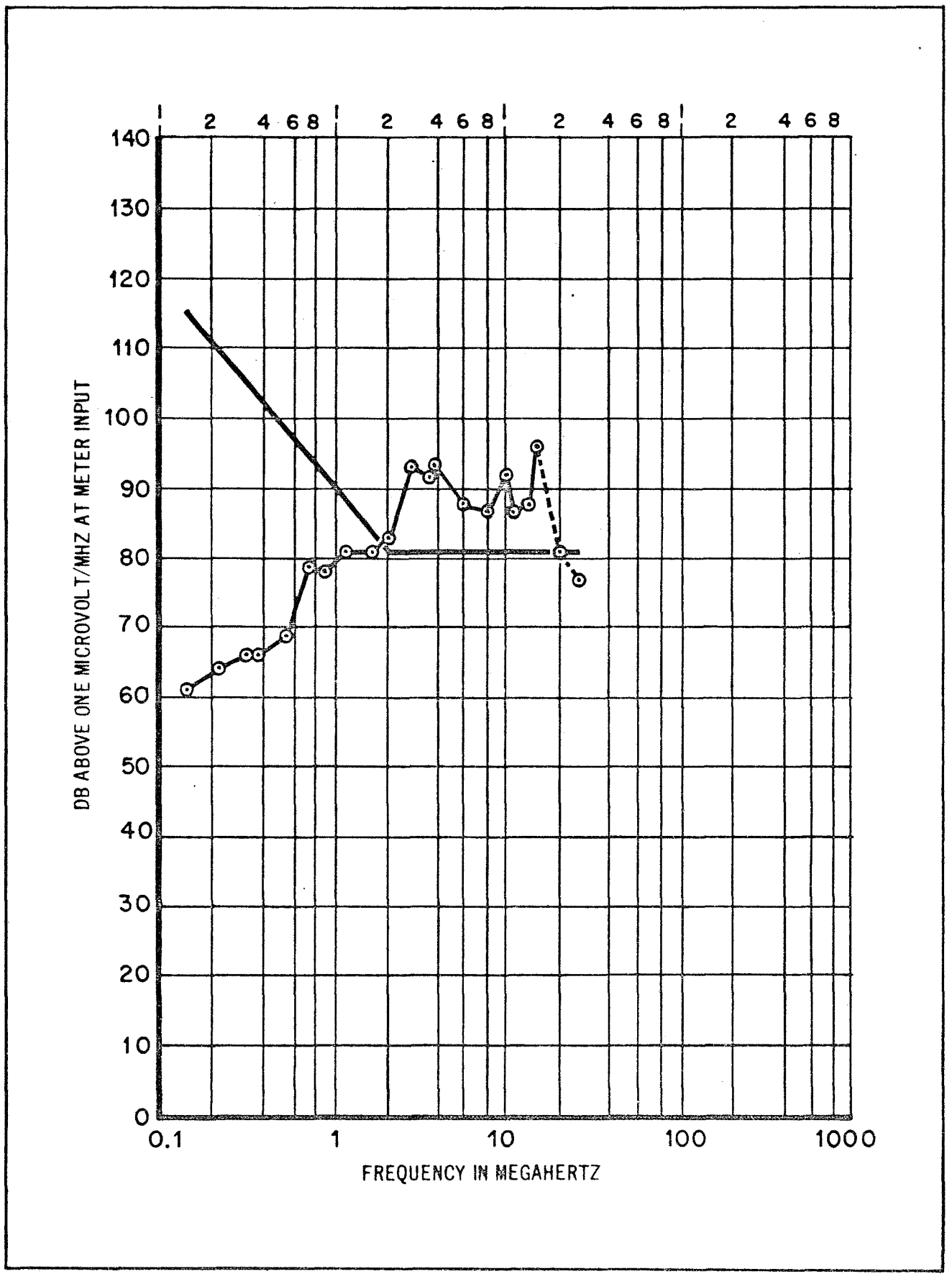

Figure 4–3. Model DSV–4B–123 Test Results
Broad Band Conducted Interfence, J3 (Pin "A"),
28 VDC Return Line

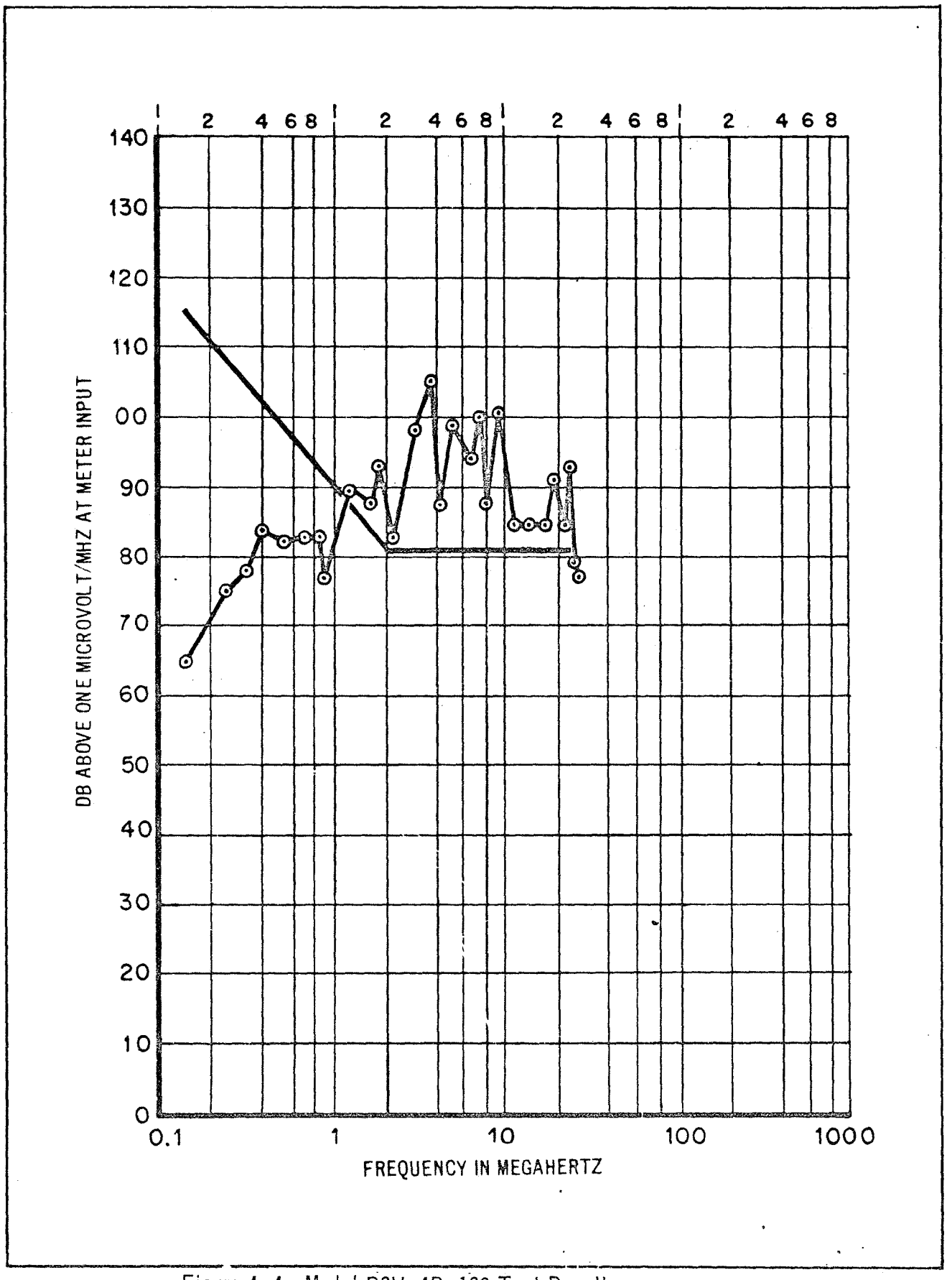

Figure 4–4. Model DSV–4B–123 Test Results
Broad Band Conducted Interference, J3 (Pin "B"),
28 VDC Return Line

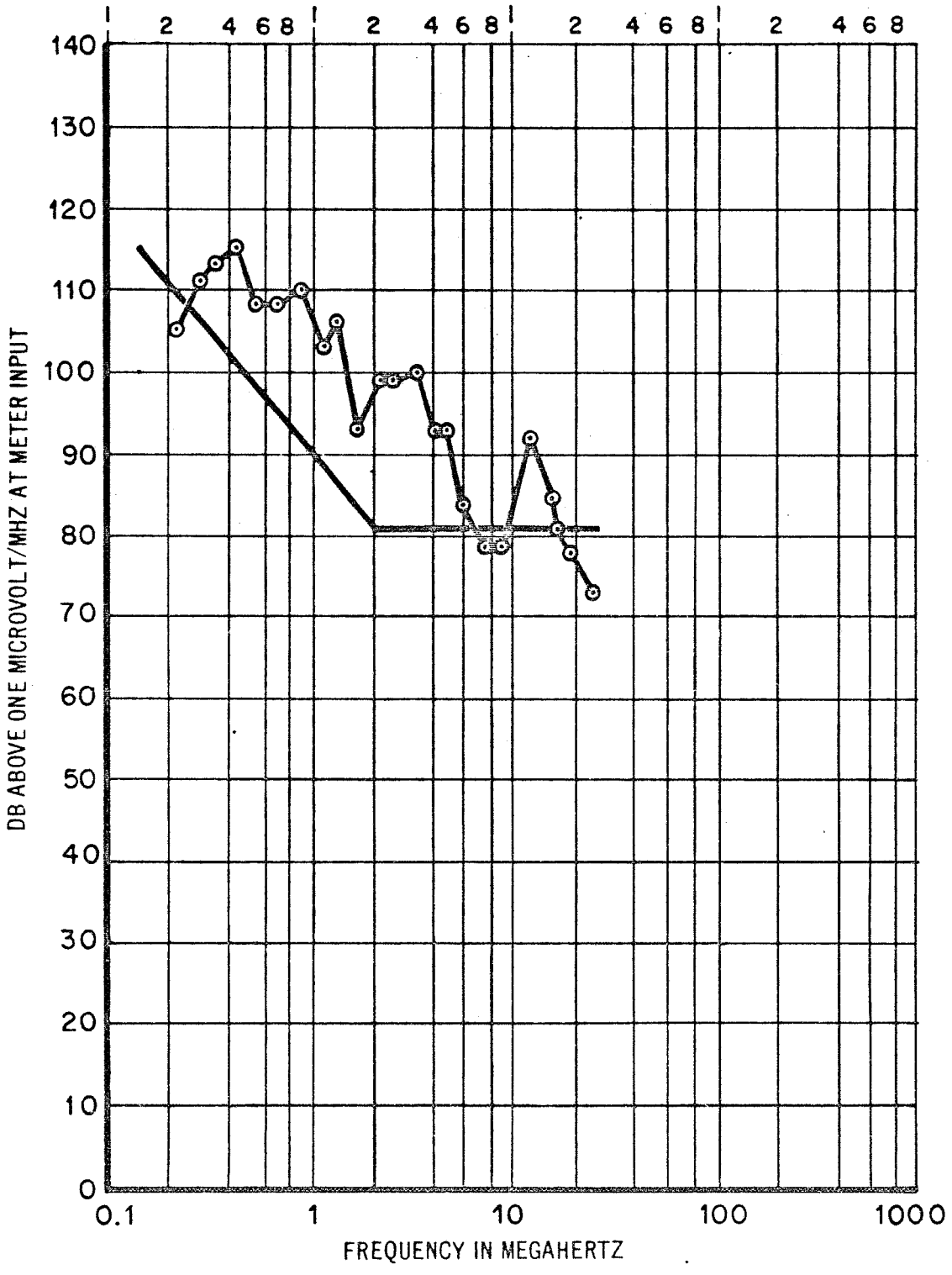

Figure 4–5. Model DSV–4B–123 Test Results
Broad Band Conducted Interfence, J4 (Pin "A"),
115 VAC, 60 Cycle A Ø Input Power Line

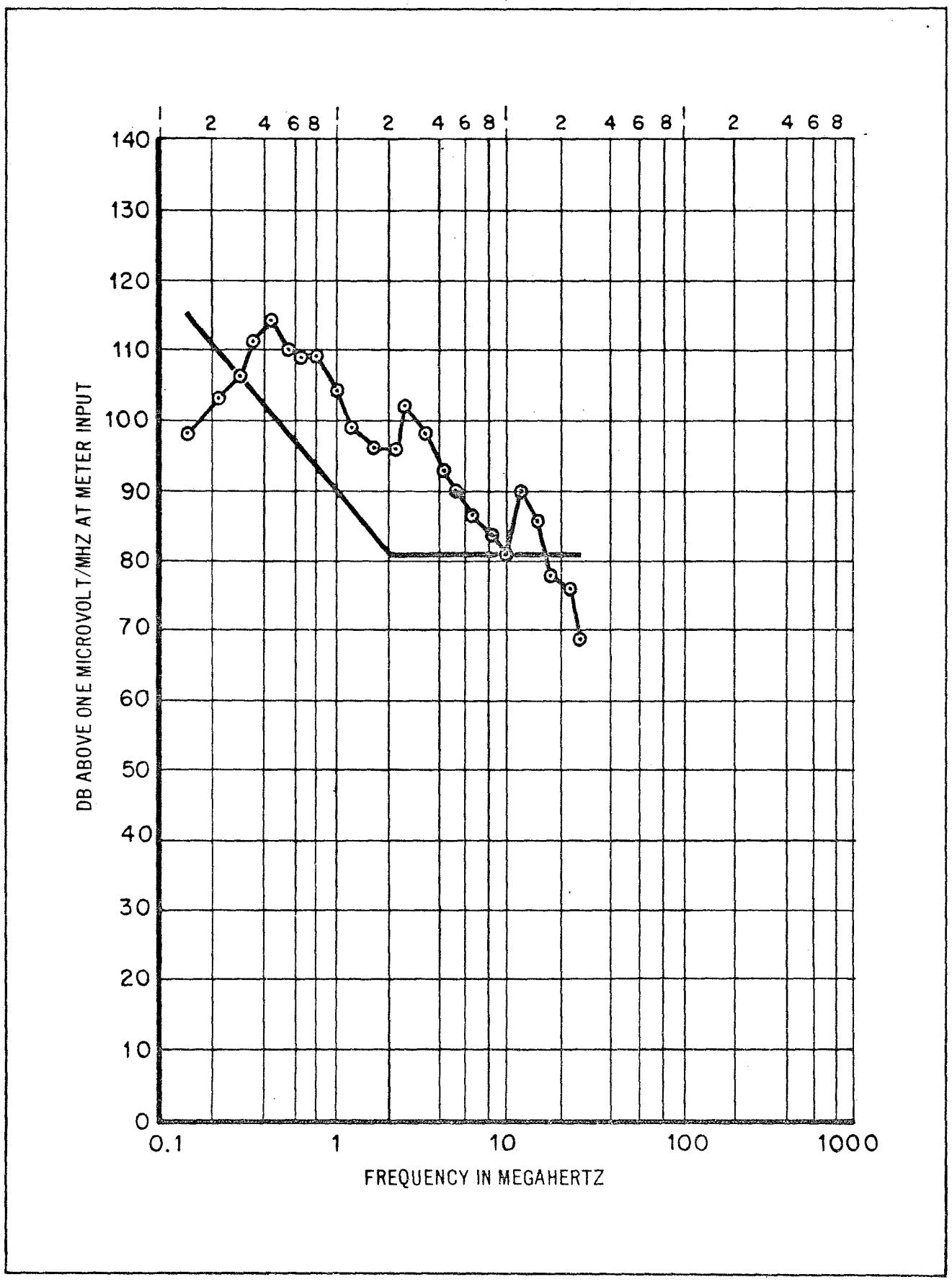

Figure 4–6. Model DSV–4B–123 Test Results
Broad Band Conducted Interference, J4 (Pin "D"),
115 VAC, 60 Cycle Return Line

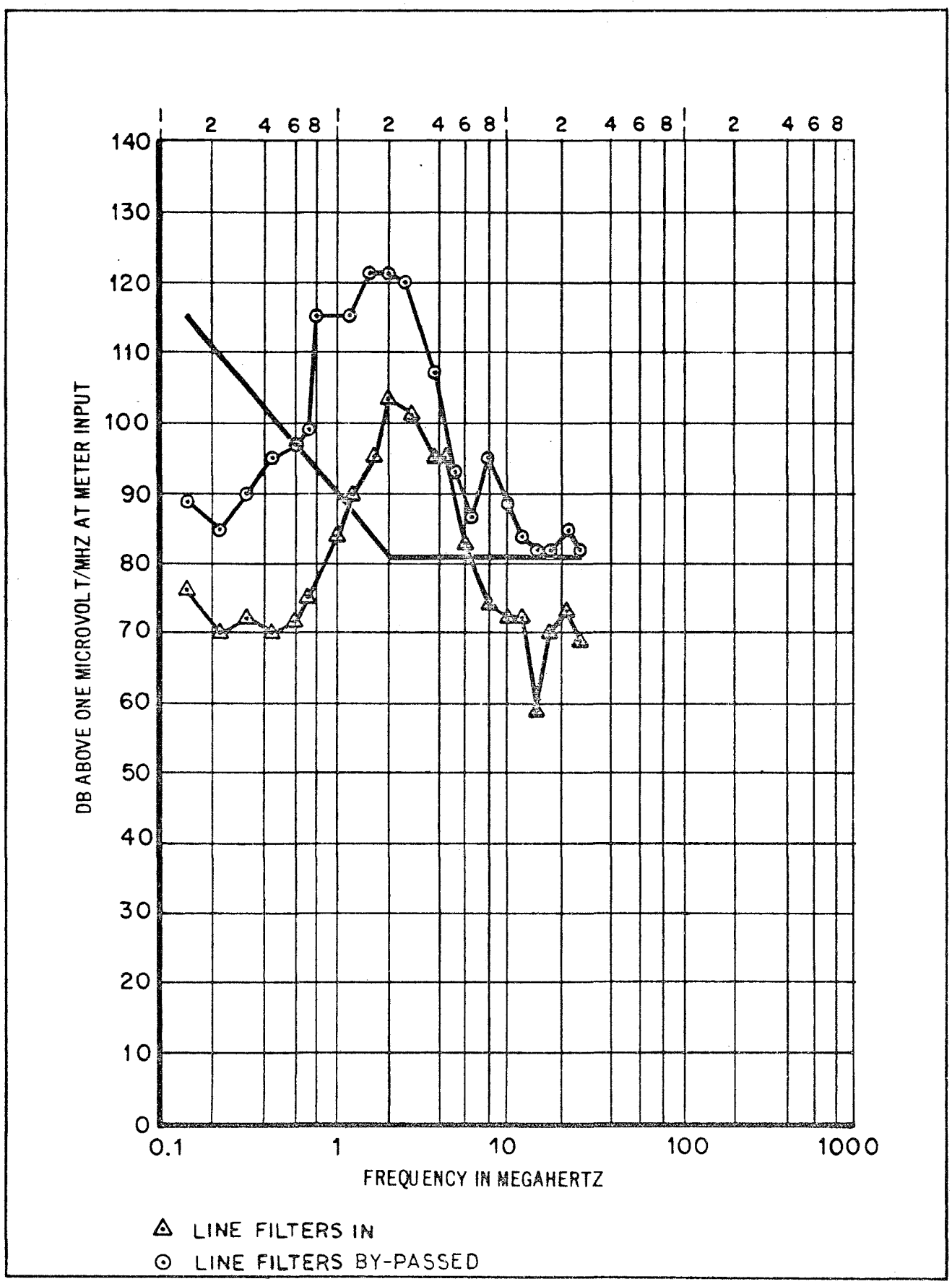

Figure 4–7. Model DSV–4B–123 Test Results
Secondary Test Broad Band Steady State Conducted
Interference (28 VDC Input Power Line)

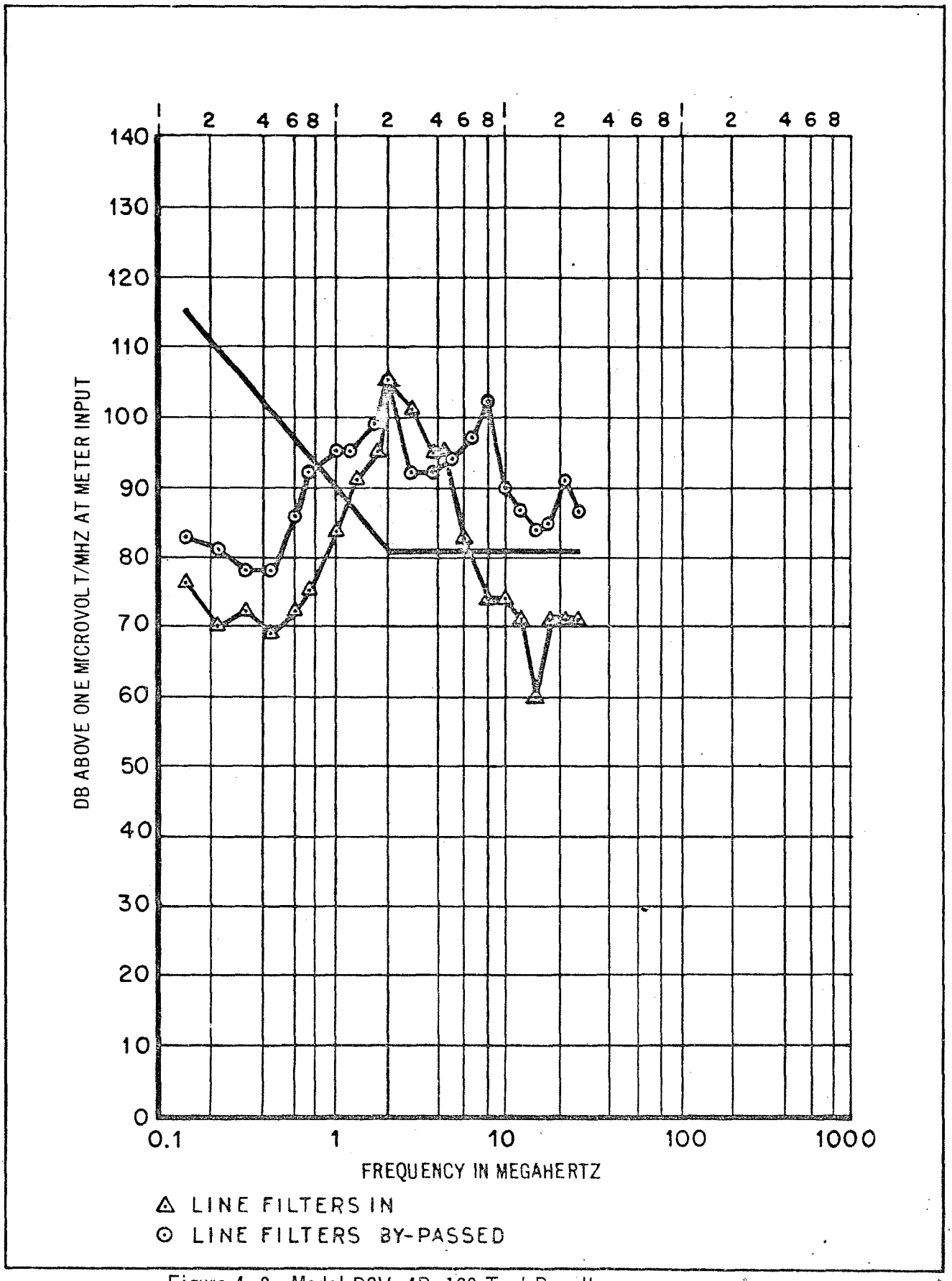

Figure 4–8. Model DSV–4B–123 Test Results
Secondary Test Broad Band Steady State Conducted
Interference (28 VDC Return Line)

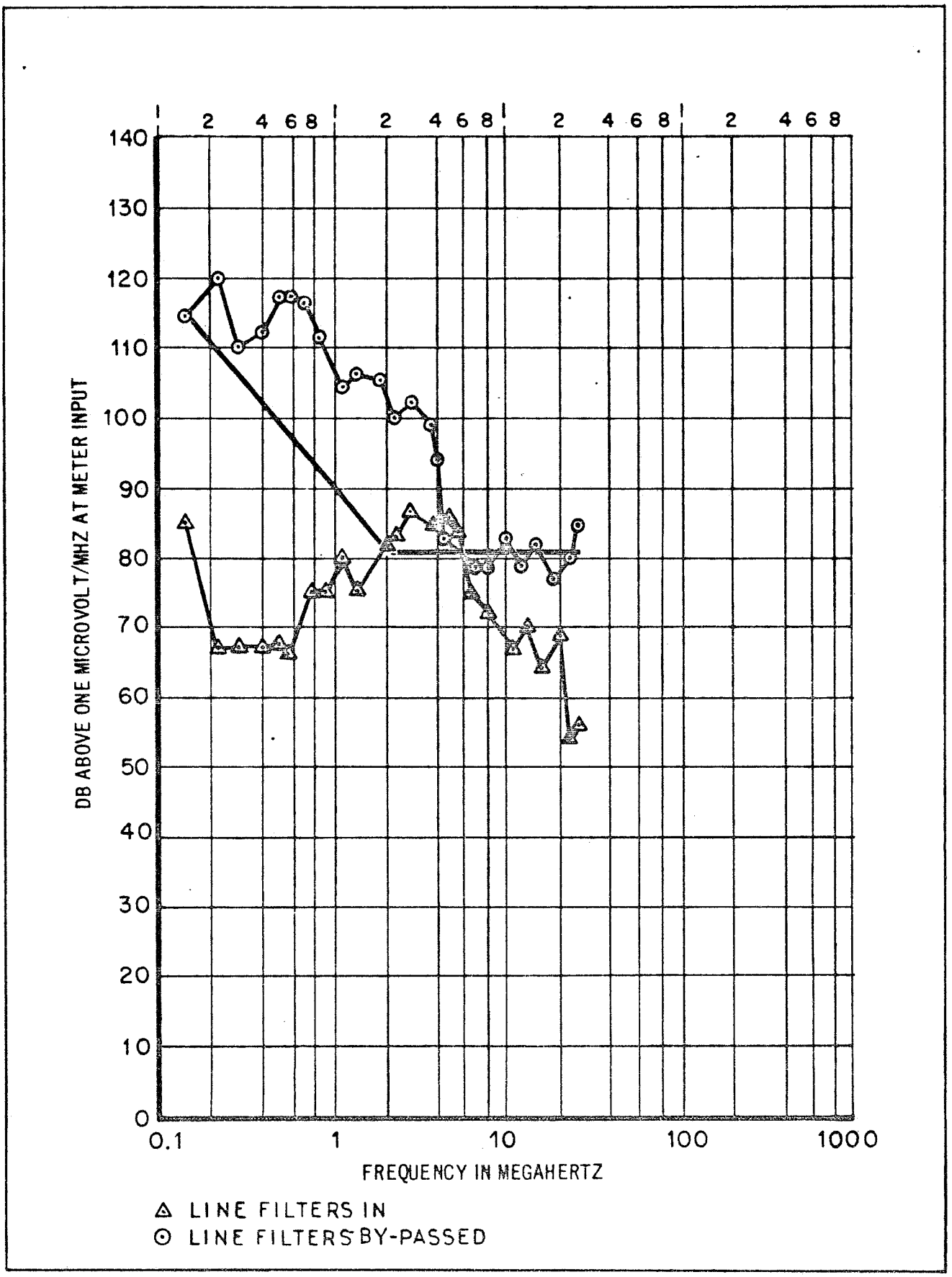

Figure 4–9. Model DSV–4B–123 Test Results
Secondary Test Broad Band Steady State Conducted
Interference (115 VAC, 60 Cycle A Ø Input Power Line)

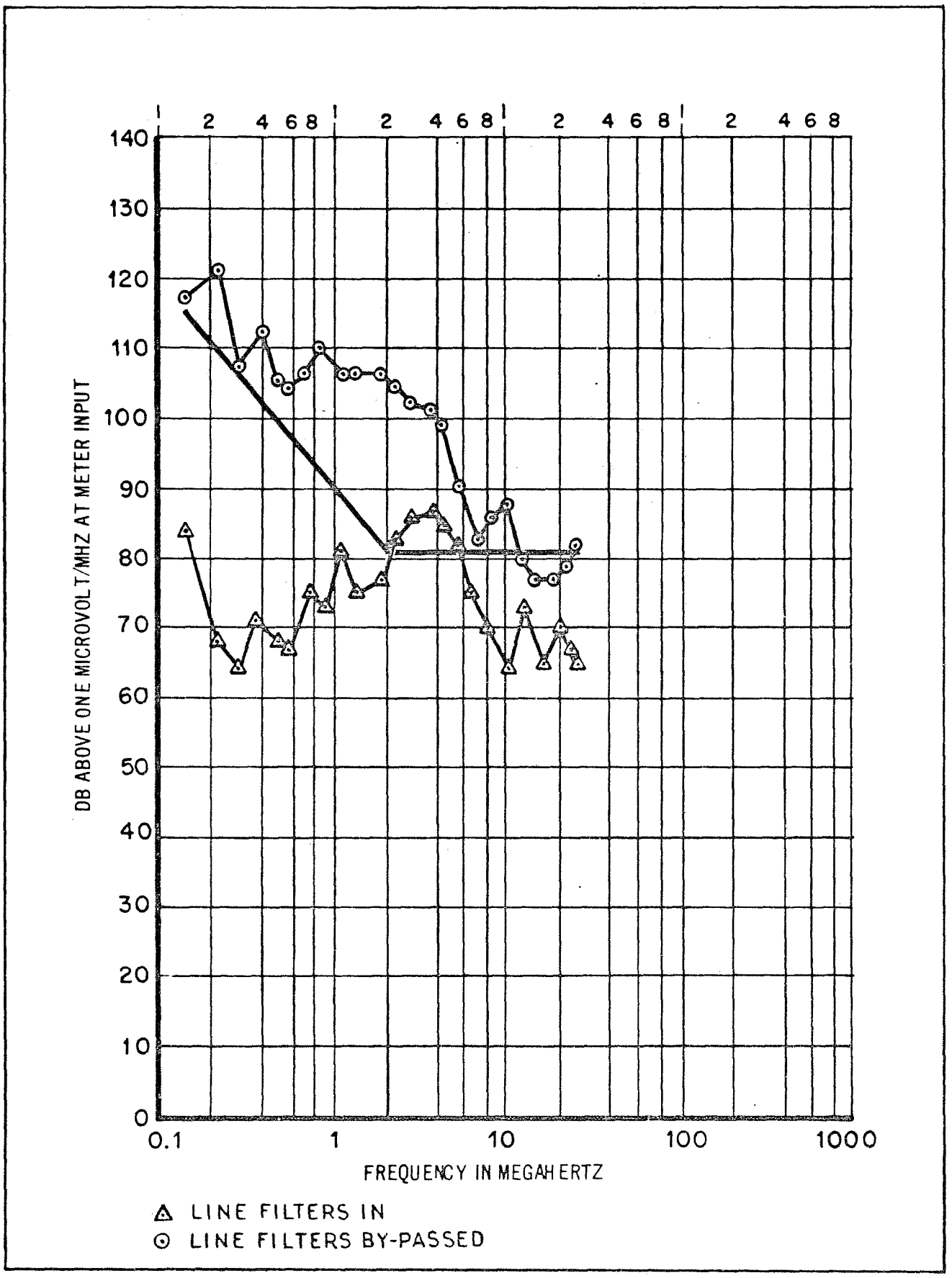

Figure 4–10. Model DSV–4B–123 Test Results
Secondary Test Broad Band Steady State Conducted
Interference (115 VAC, 60 Cycle A Ø Return Line)

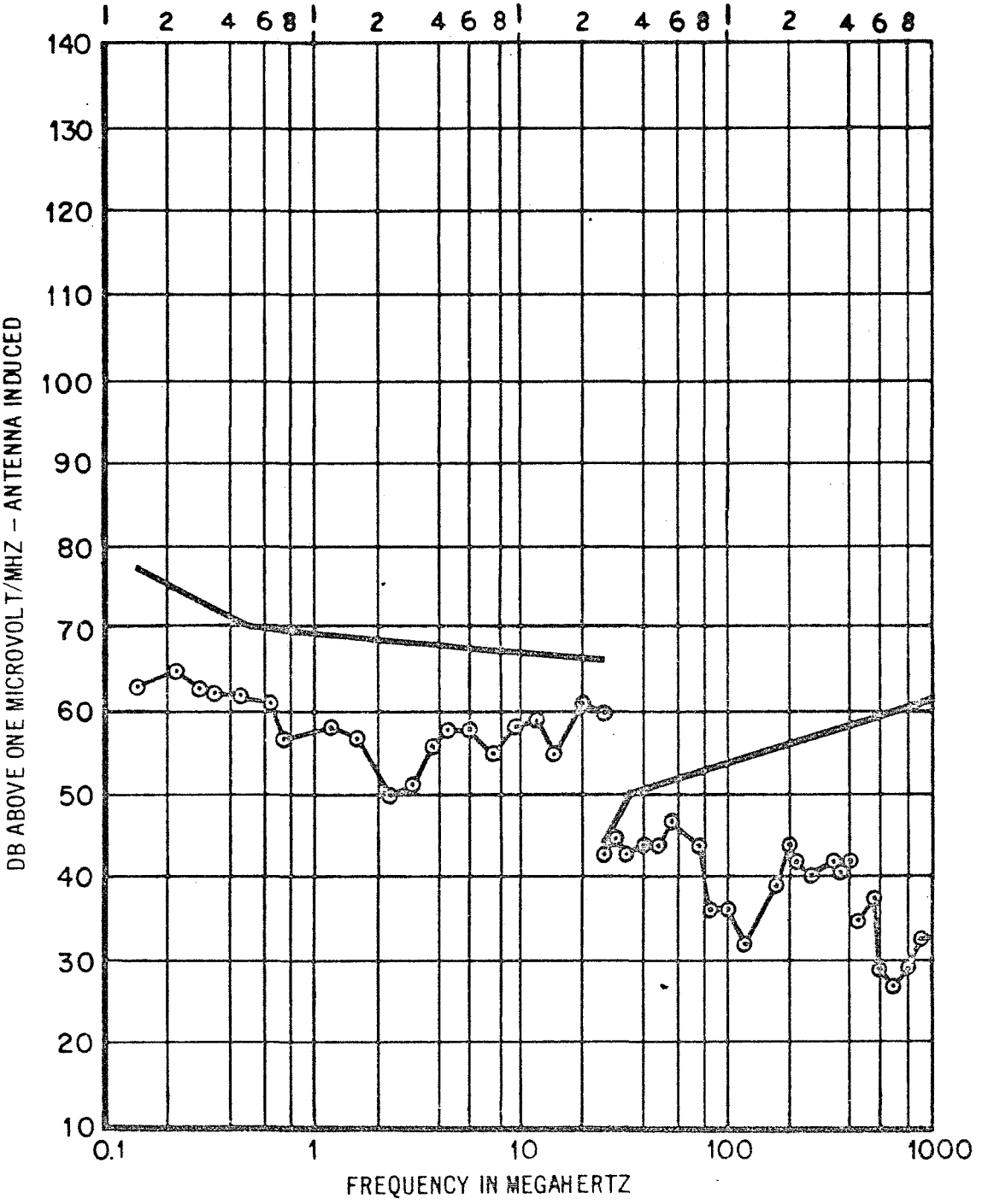

Figure 4-11. Model DSV-4B-123 Test Results
Broad Band Steady State Radiated Interference
(Console Doors Closed)

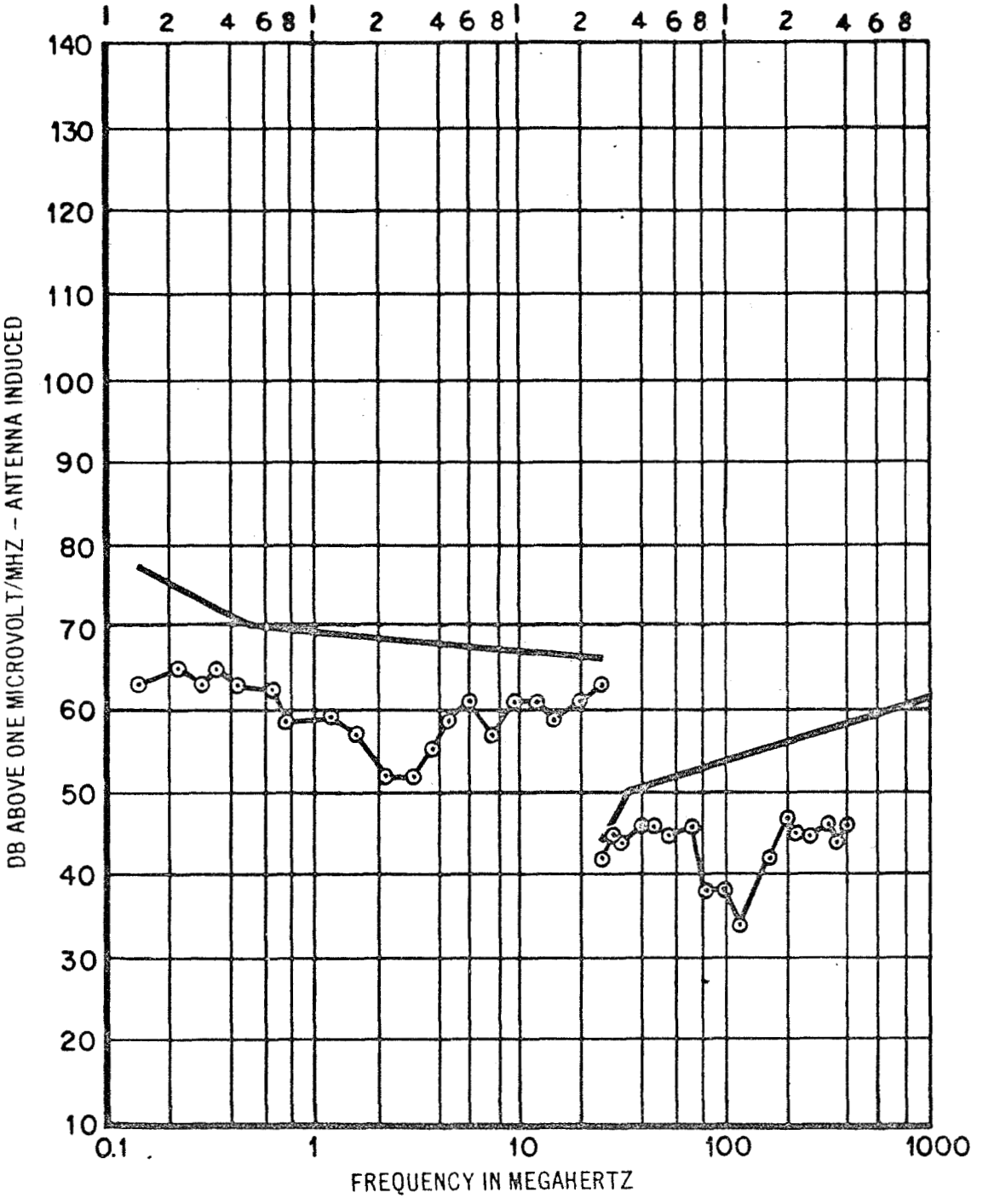

Figure 4–12. Model DSV–4B–123 Test Results
Broad Band Steady State Radiated Interference
(Console Doors Open)

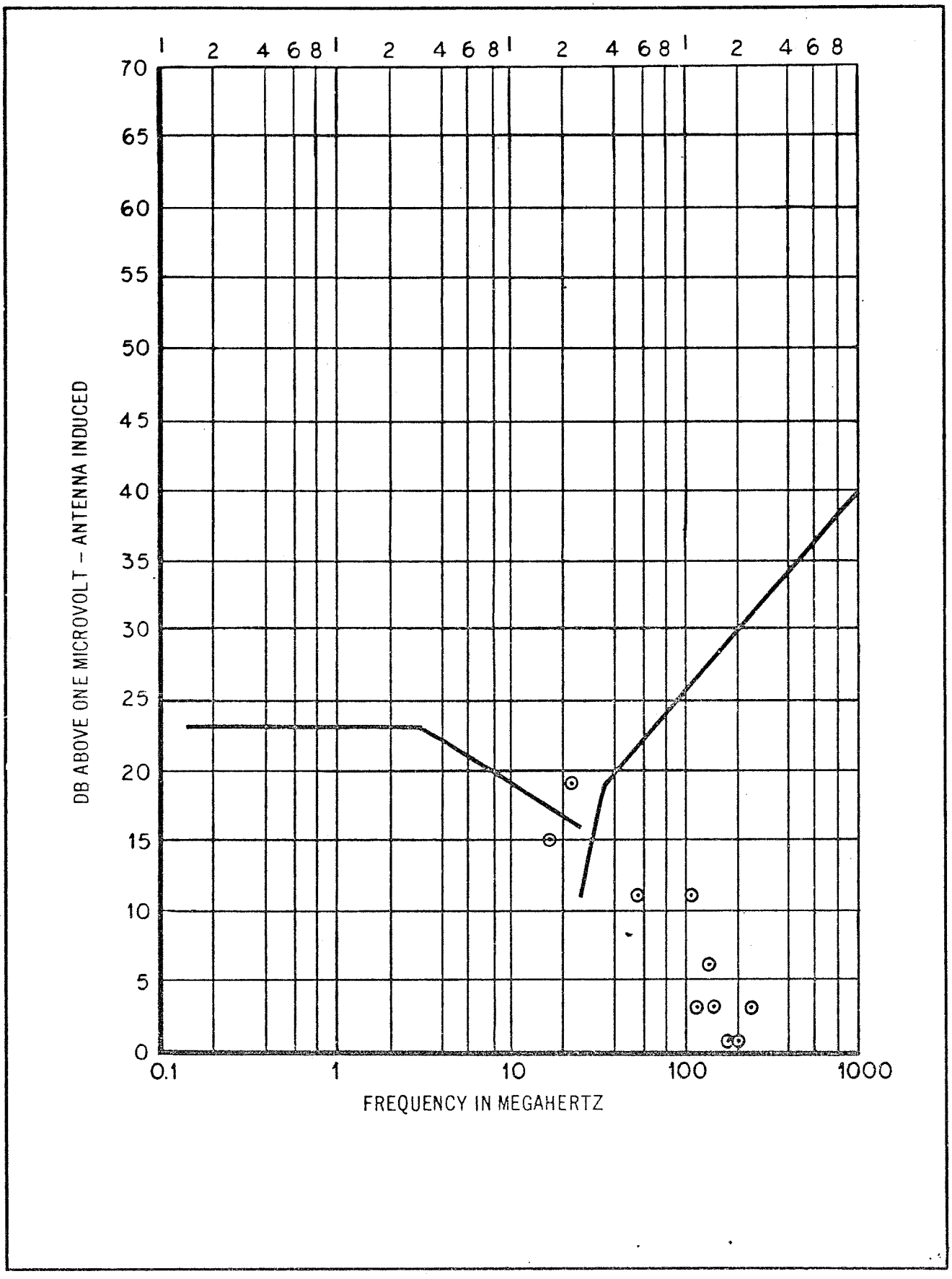

Figure 4–13. Model DSV–4B–123 Test Results
Narrow Band Radiated Interference, Telemetrics
Power Supply (Console Doors Closed)

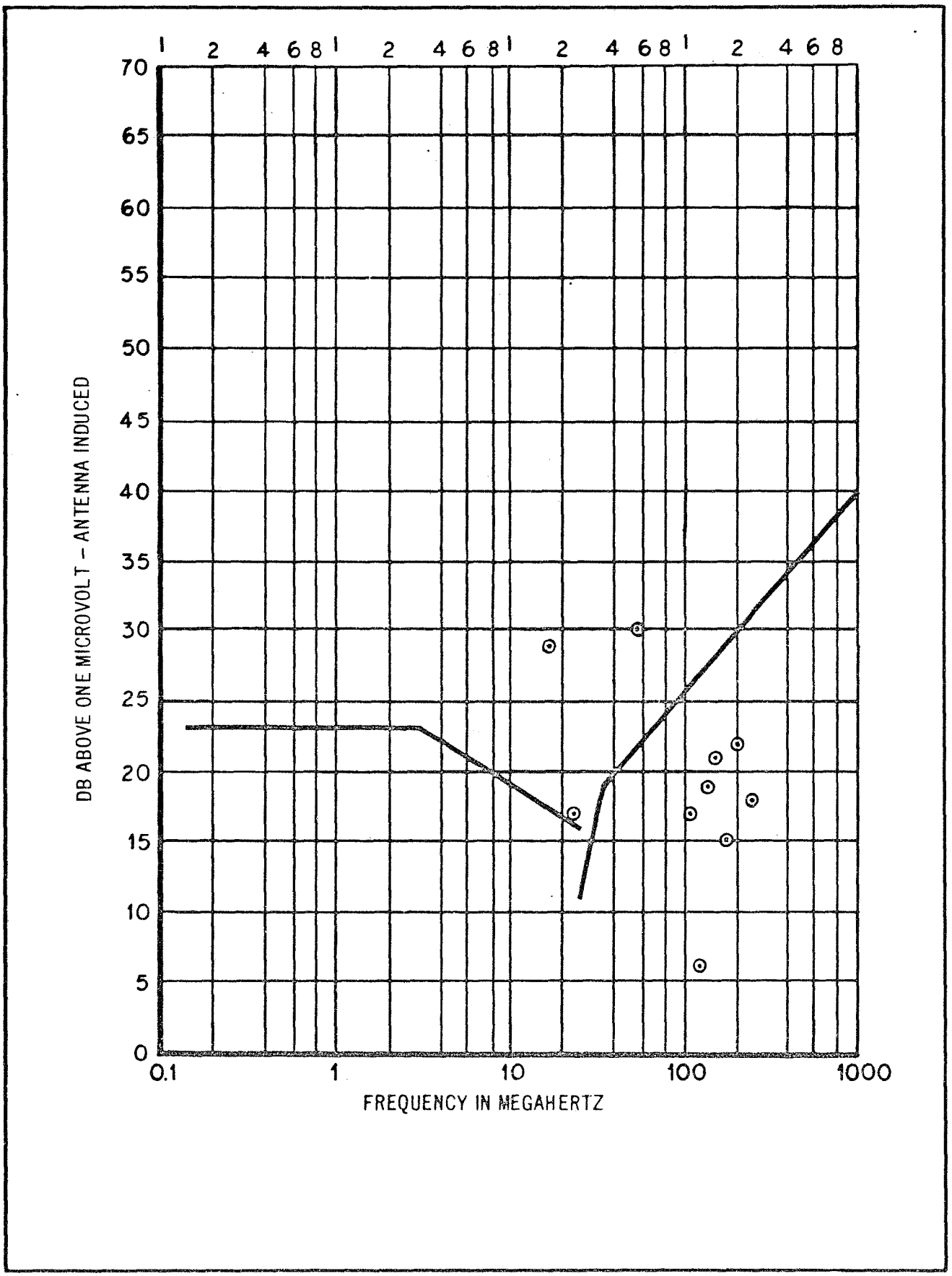

Figure 4–14. Model DSV–4B–123 Test Results
Narrow Band Radiated Interference, Telemetrics
Power Supply (Console Doors Open)

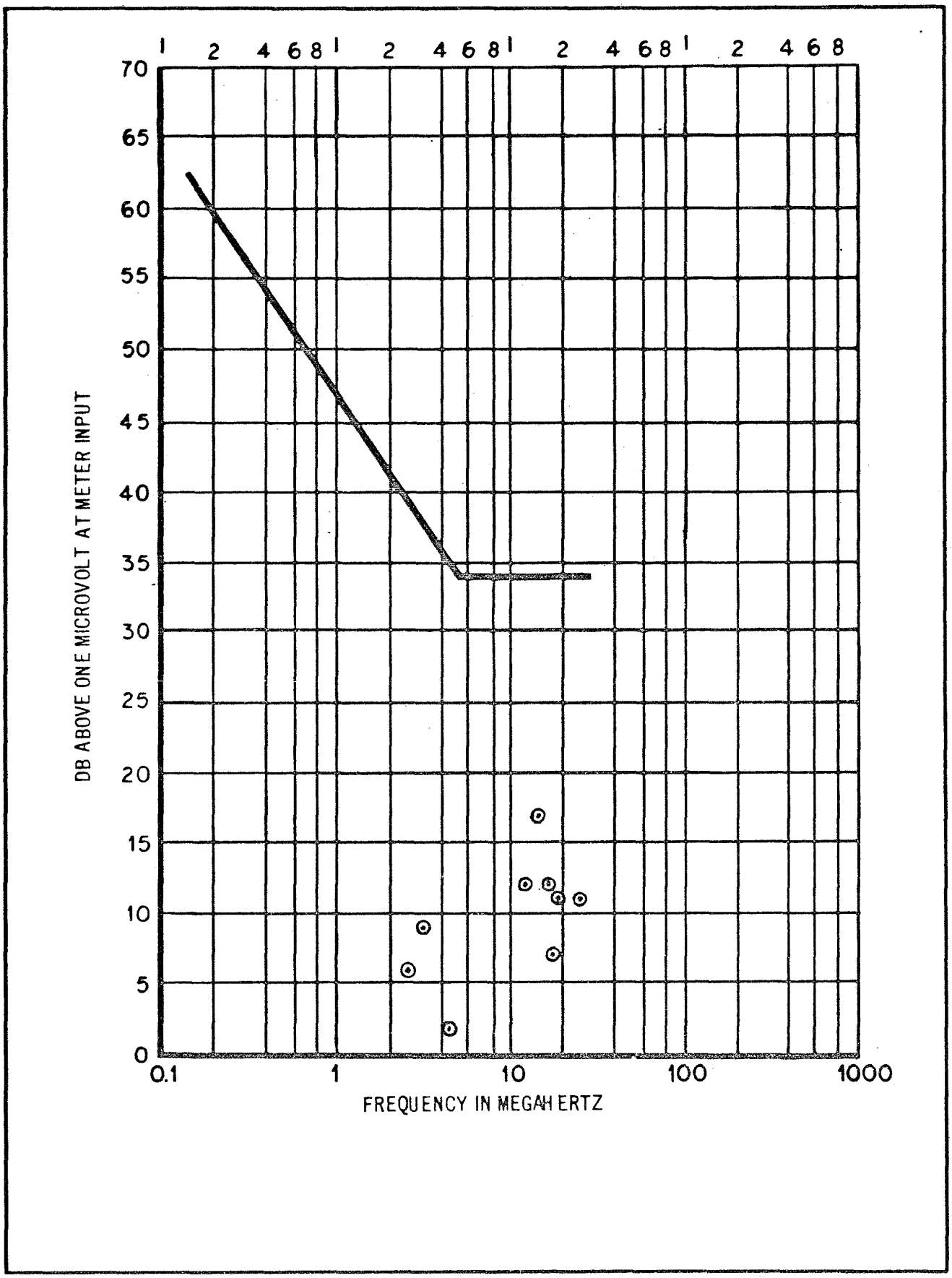

Figure 5–1. Model DSV–4B–125 Test Results
Narrow Band Conducted Interference, J3 (Pin "A"),
115 VAC, 60 Cycles, A Ø Input Power Line

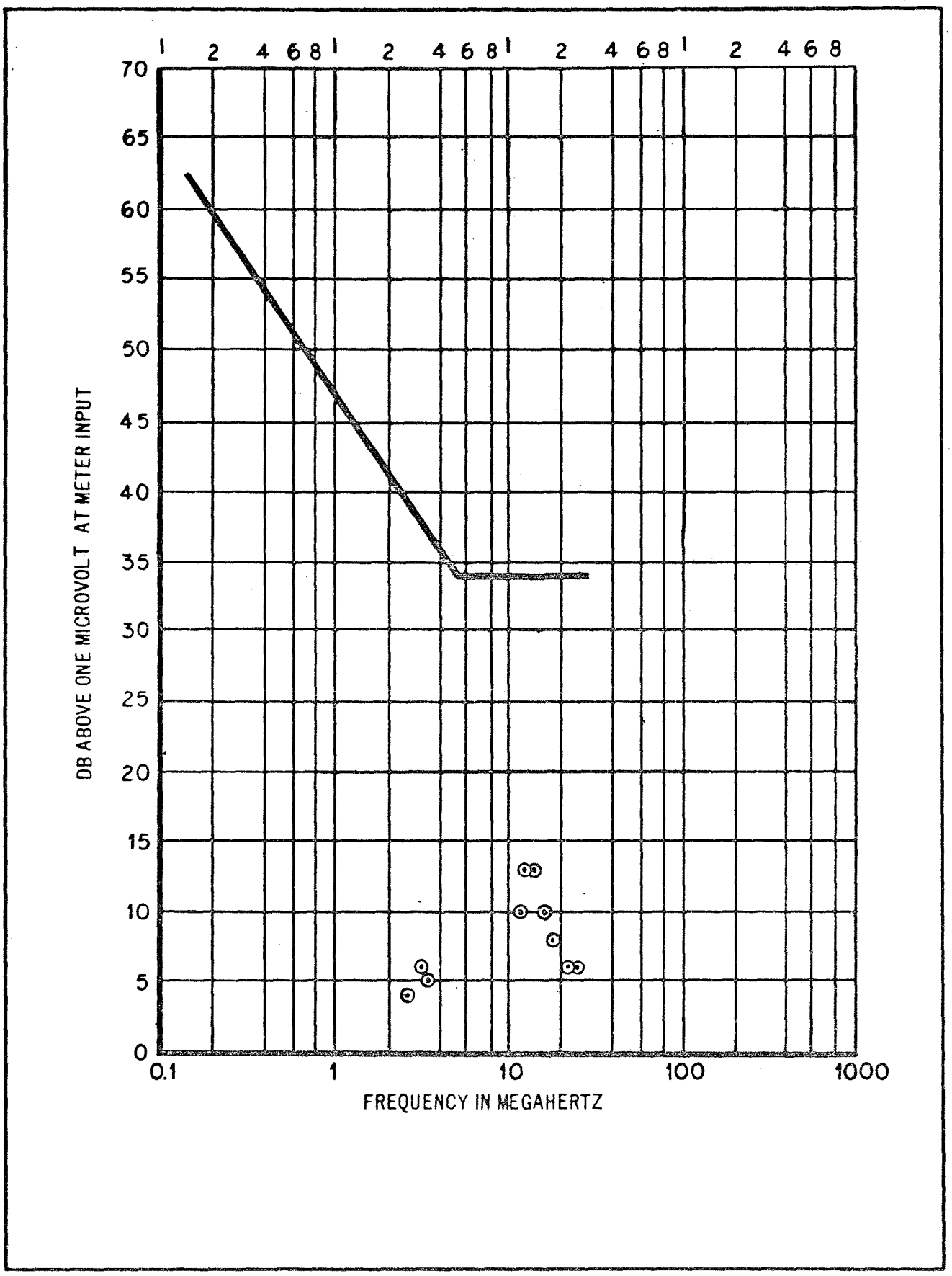

Figure 5–2. Model DSV–4B–125 Test Results
Narrow Band Conducted Interference, J3 (Pin "B"),
115 VAC, 60 Cycles, B Ø Input Power Line

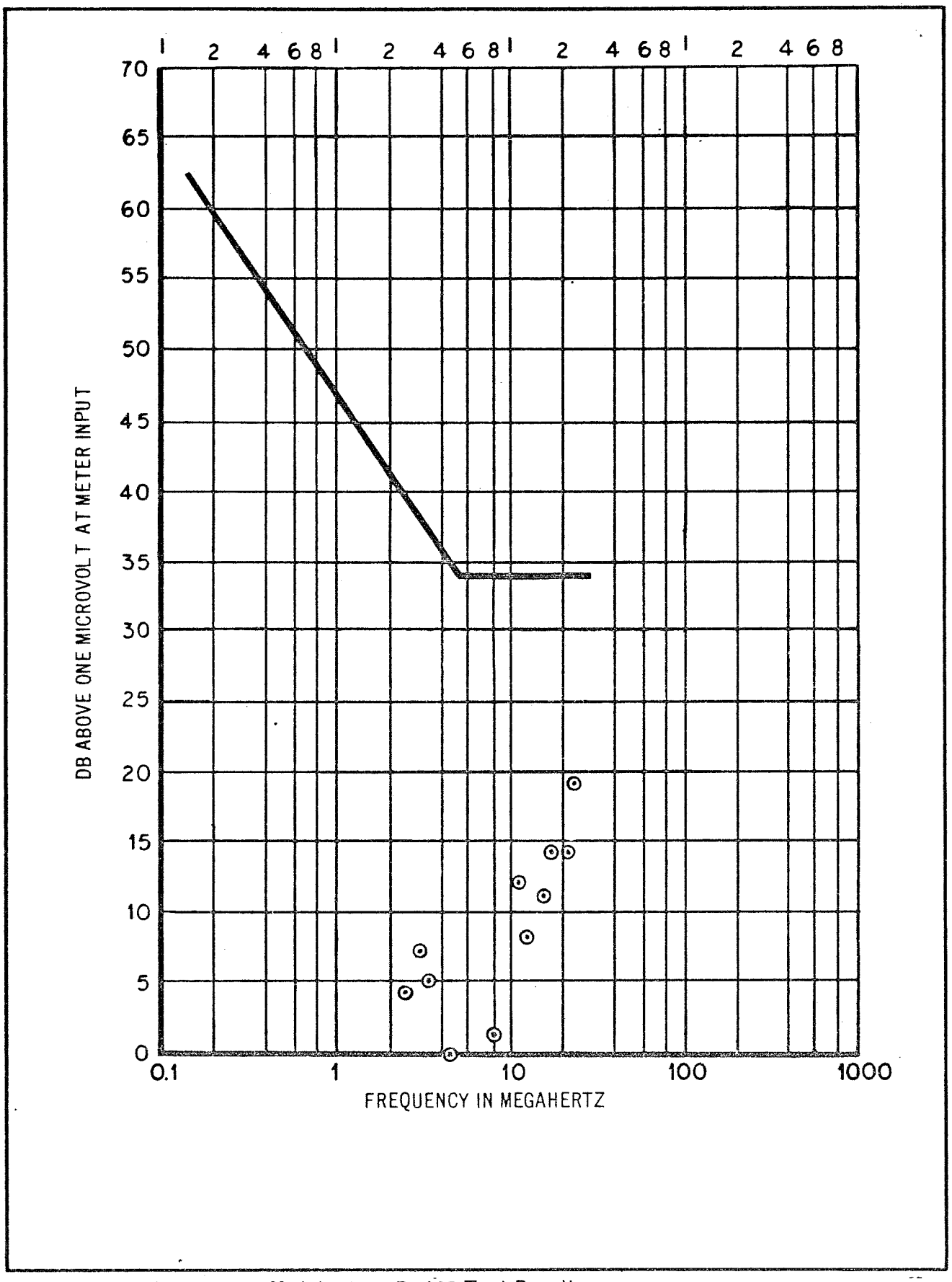

Figure 5–3. Model DSV–4B–125 Test Results
Narrow Band Steady State Conducted Interference,
J3 (Pin "C"), 115 VAC, 400 Cycle, C Ø Input Power Line

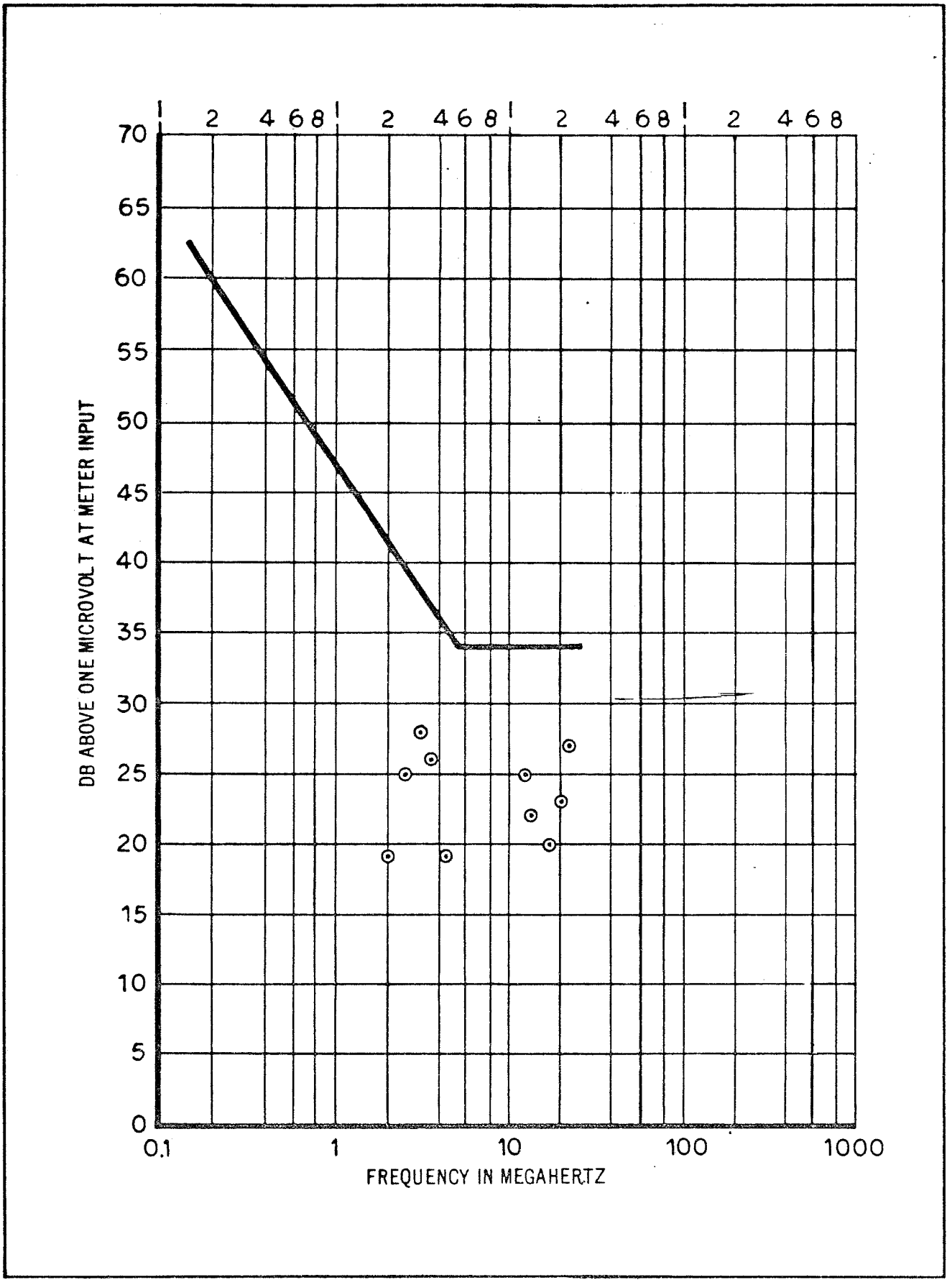

Figure 5–4. Model DSV–4B–125 Test Results
Narrow Band Conducted Interference, J3 (Pin "D"),
115 VAC, 400 Cycles, C Ø Return Line

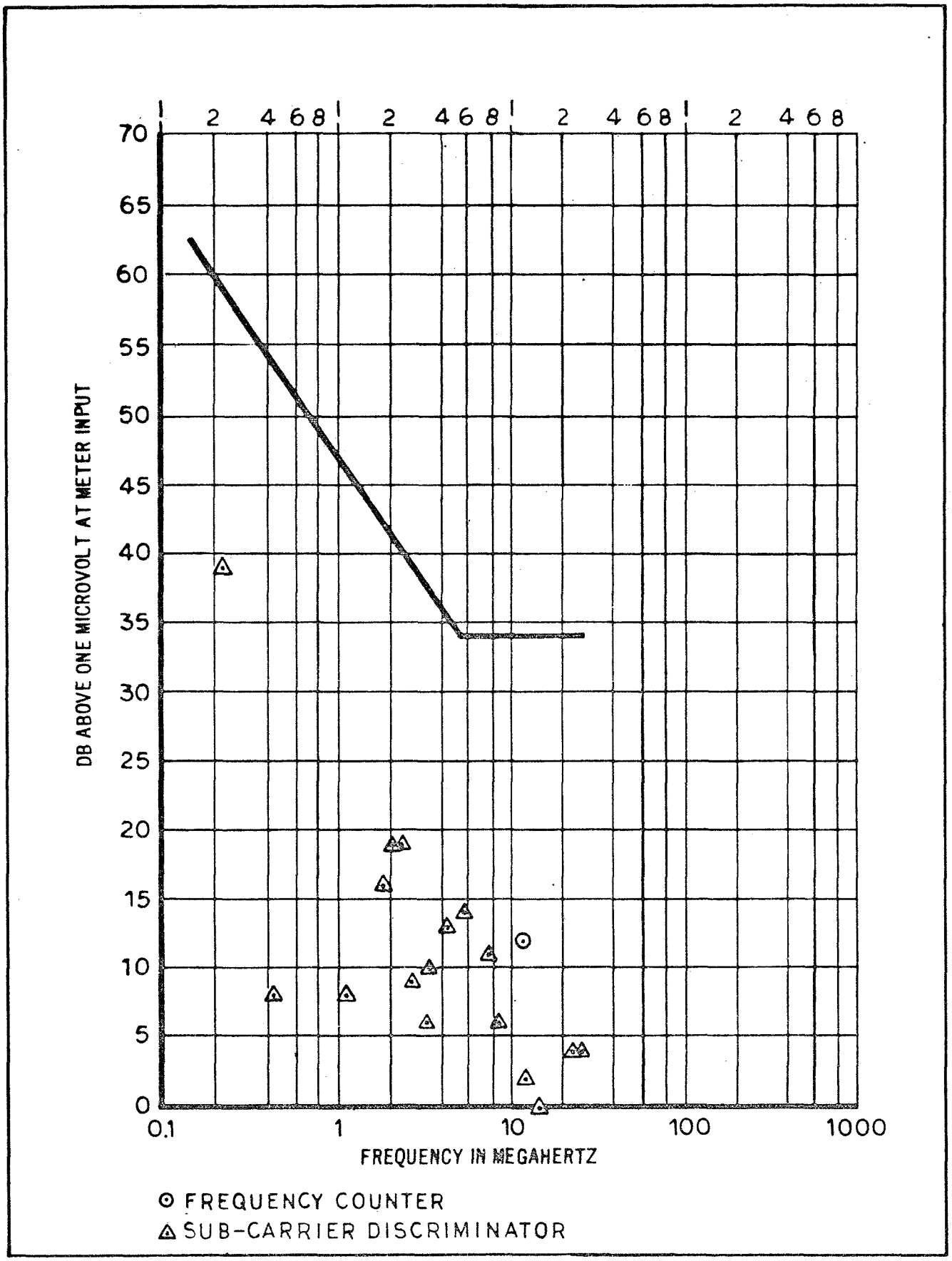

Figure 5–5. Model DSV–4B–125 Test Results
Narrow Band Conducted Interference, J1 (Pin "B"),
60 Cycles, Input Power Line

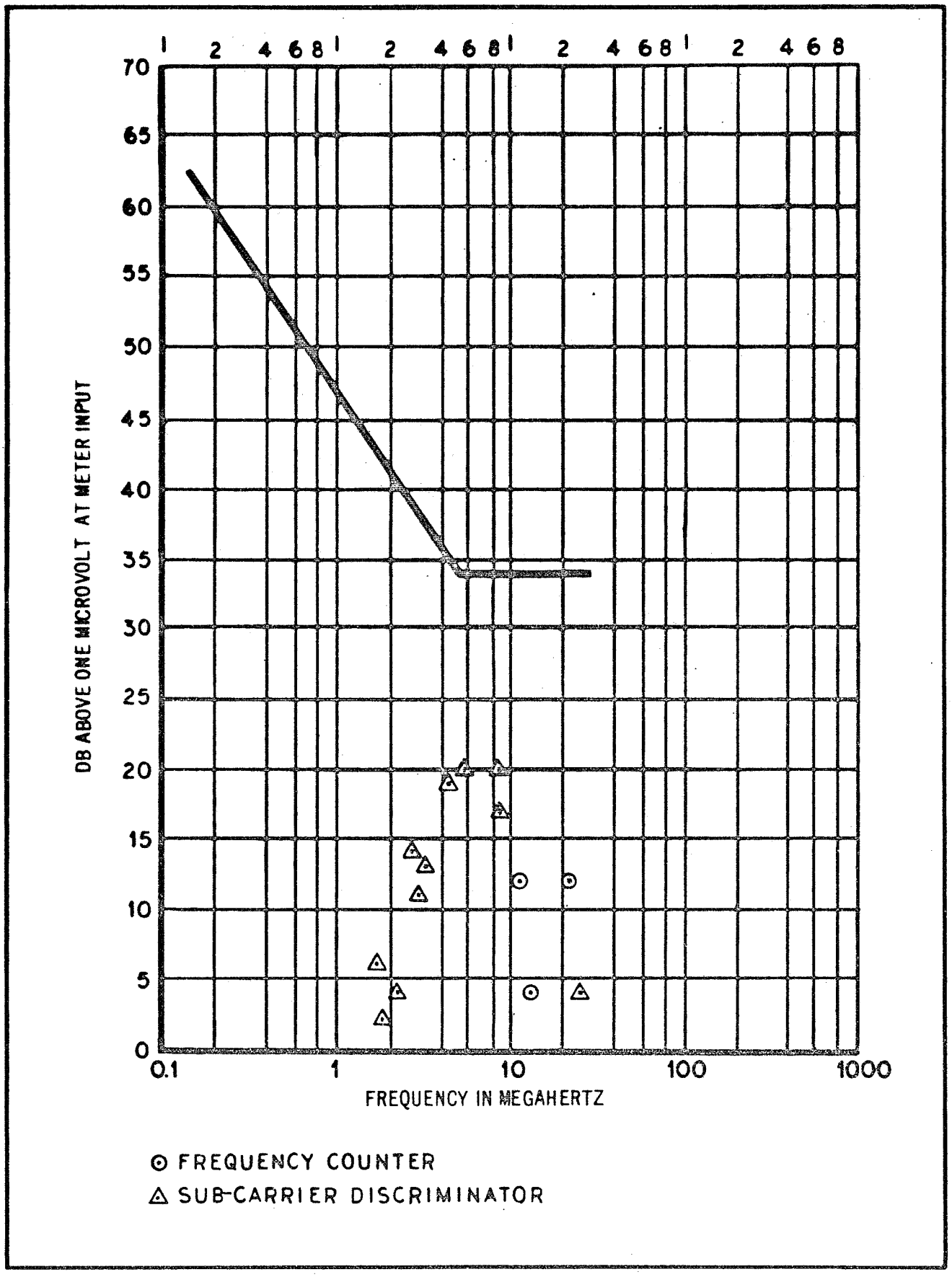

Figure 5-6. DSV-4B-125
Narrow Band Conducted Interference, J1 (Pin "D")

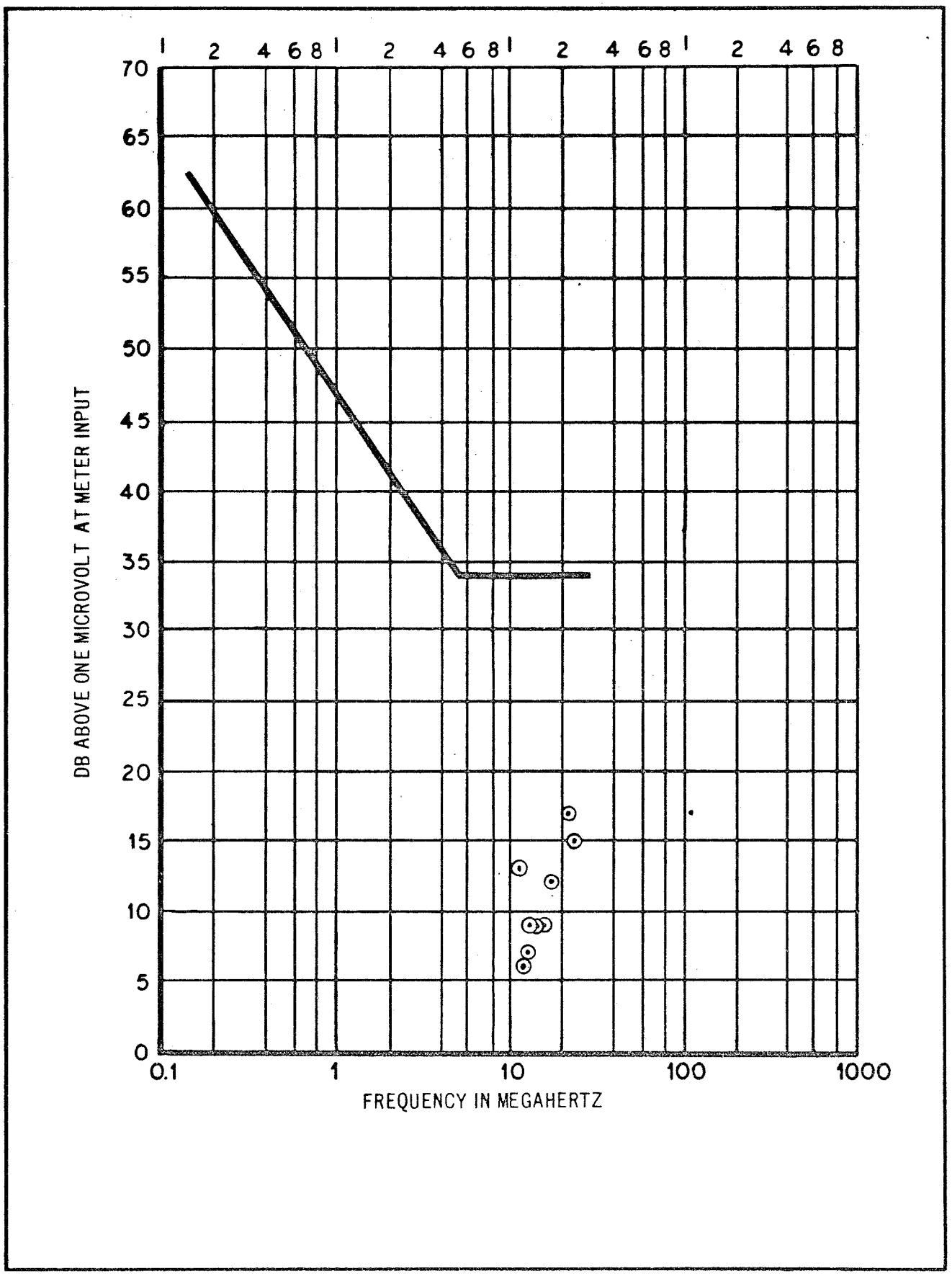

Figure 5–7. Model DSV–4B–125 Test Results
Narrow Band Conducted Interference, J2 (Pin "C"),
115 VAC, 60 Cycles Input Power Line

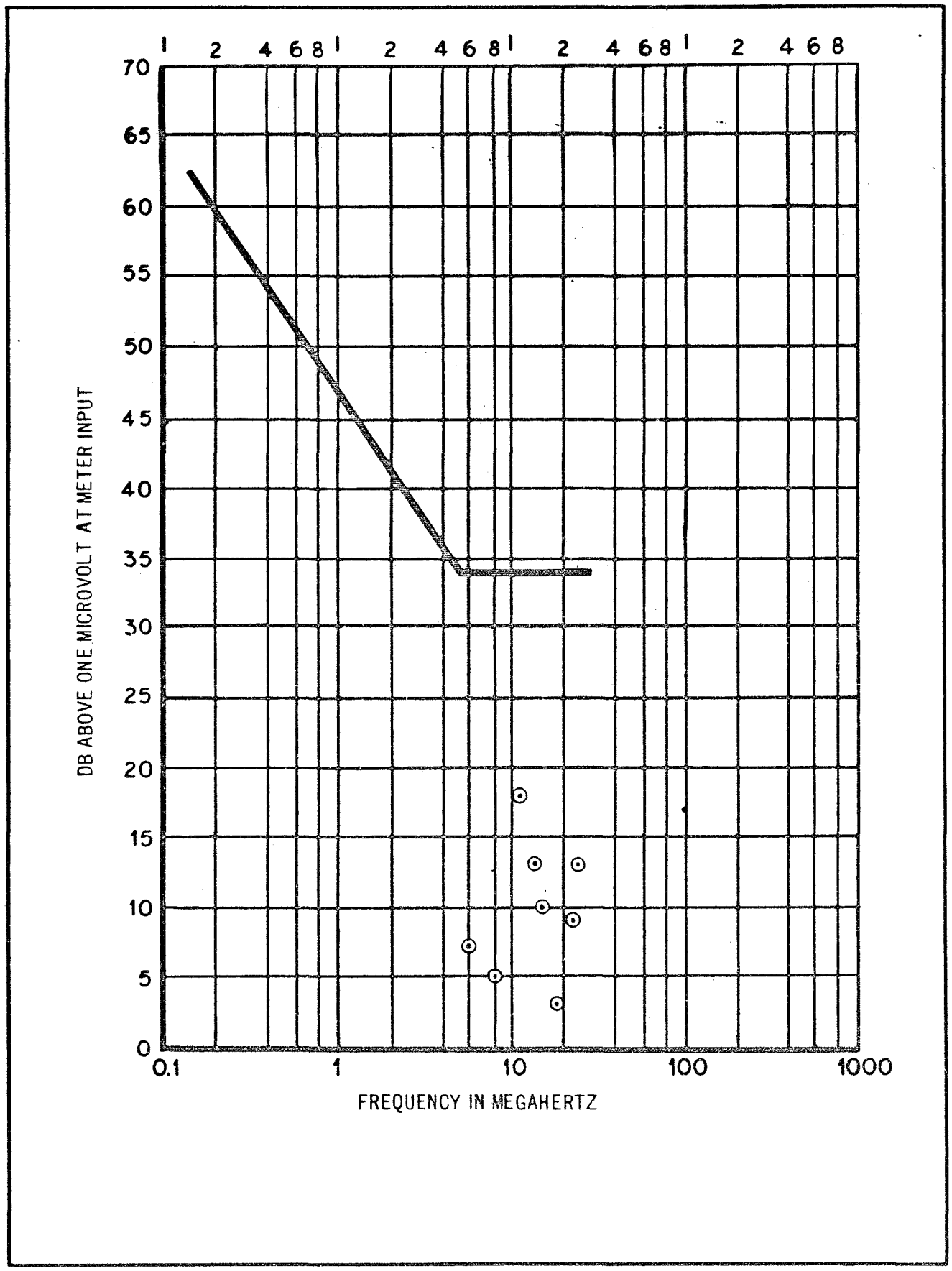

Figure 5–8. Model DSV–4B–125 Test Results
Narrow Band Conducted Interference, J2 (Pin "D"),
115 VAC, 60 Cycles Return Line

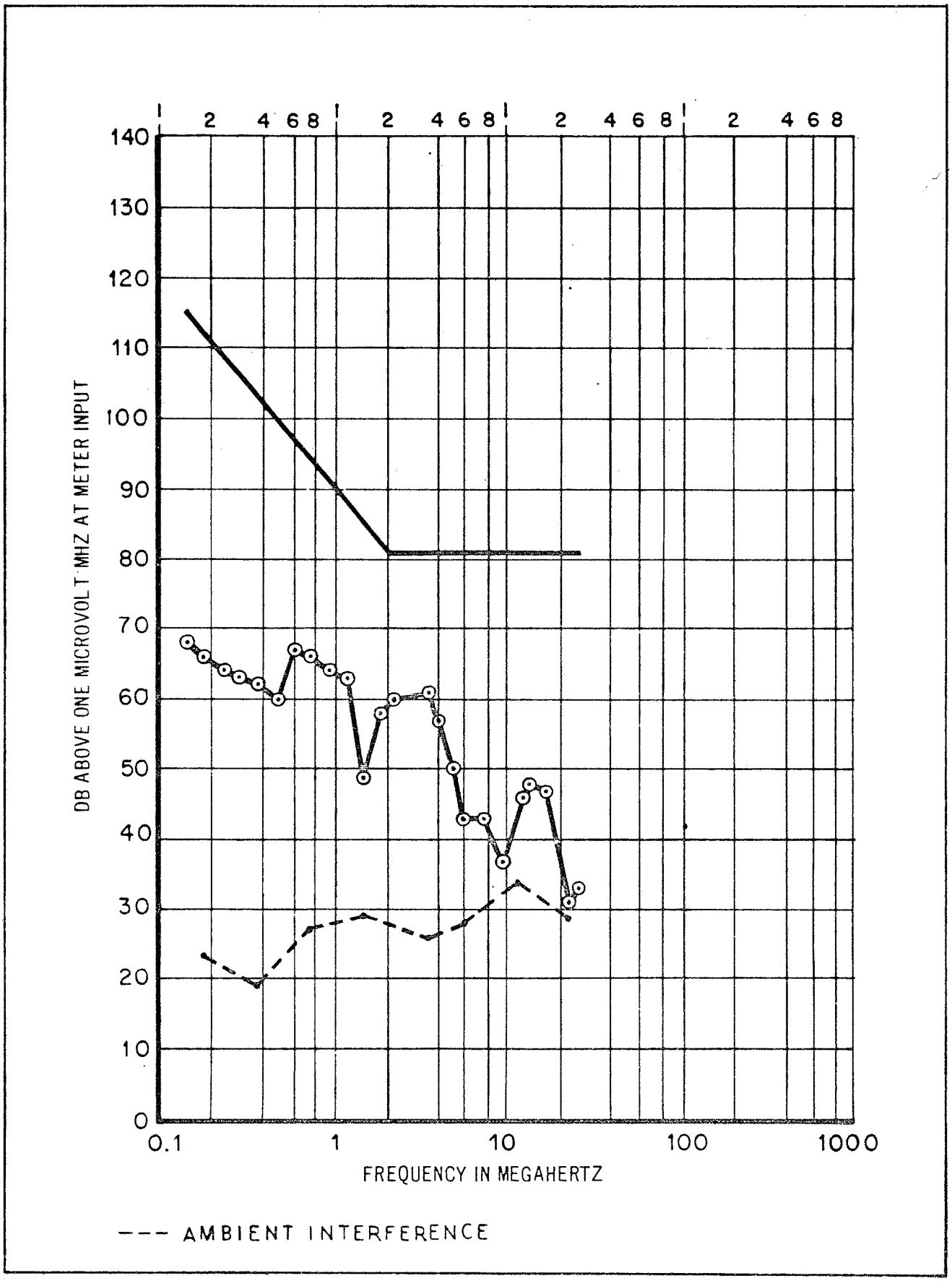

Figure 5–9. Model DSV–4B–125 Test Results
Broad Band Steady State Conducted Interference,
J3 (Pin "A"), 115 VAC, 60 Cps, A Ø Input Power Line

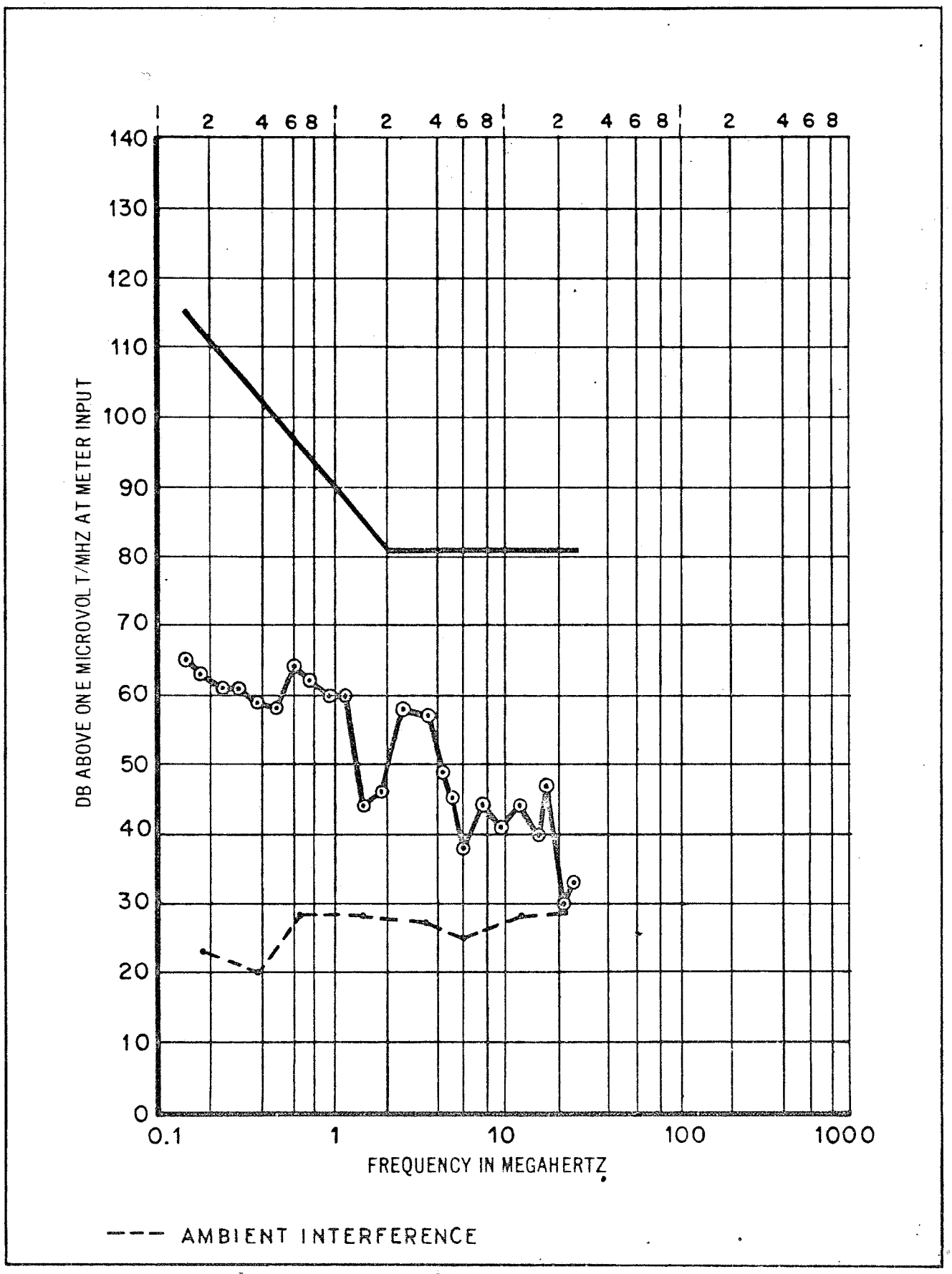

Figure 5–10. Model DSV–4B–125 Test Results
Broad Band Steady State Conducted Interference,
J3 (Pin "B"), 115 VAC, 60 Cycles, B Ø Input Power Line

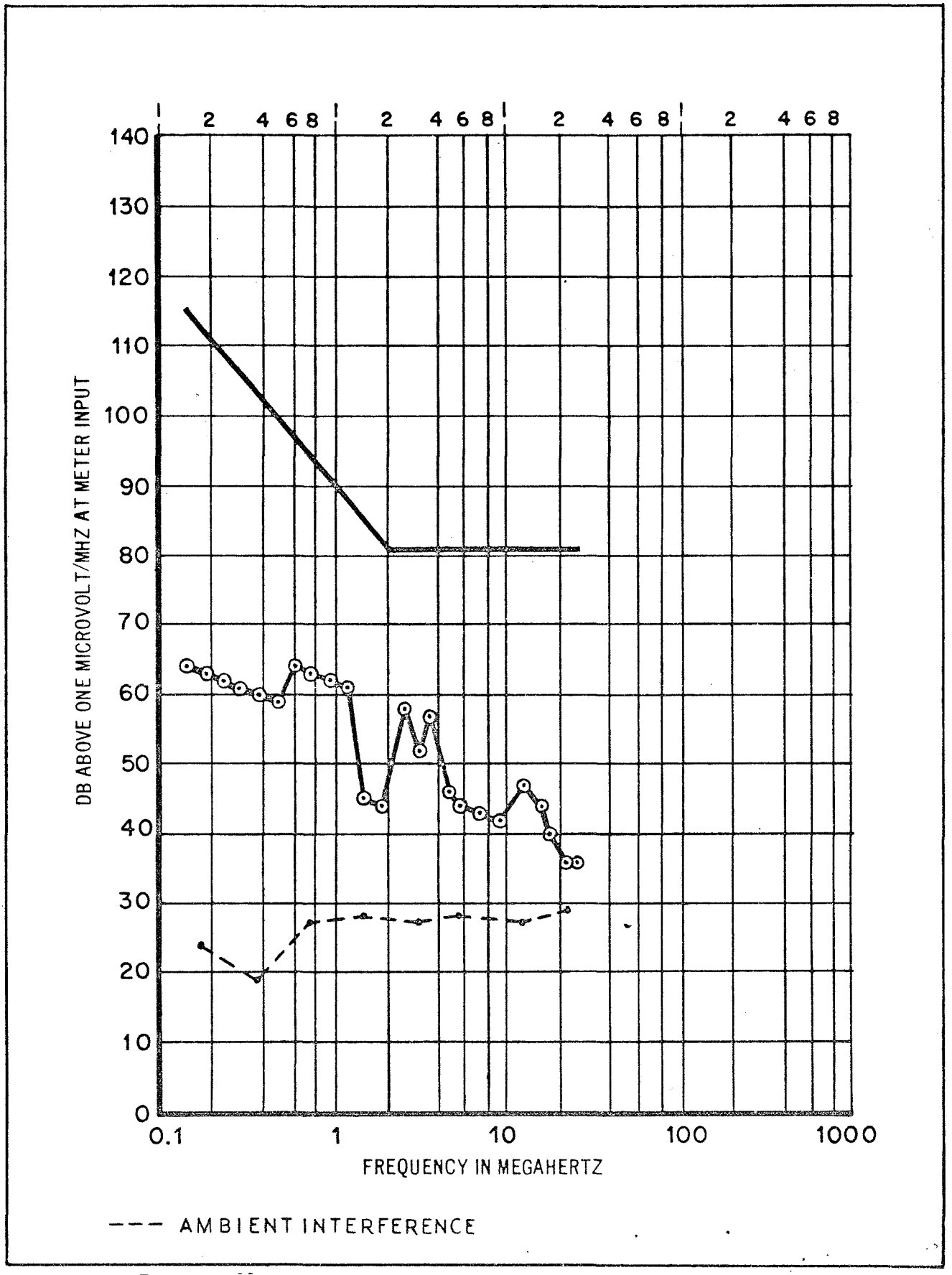

Figure 5–11. Model DSV–4B–125 Test Results
Broad Band Steady State Conducted Interference,
J3 (Pin "C"), 115 VAC, 400 Cycles, C Ø Input Power Line

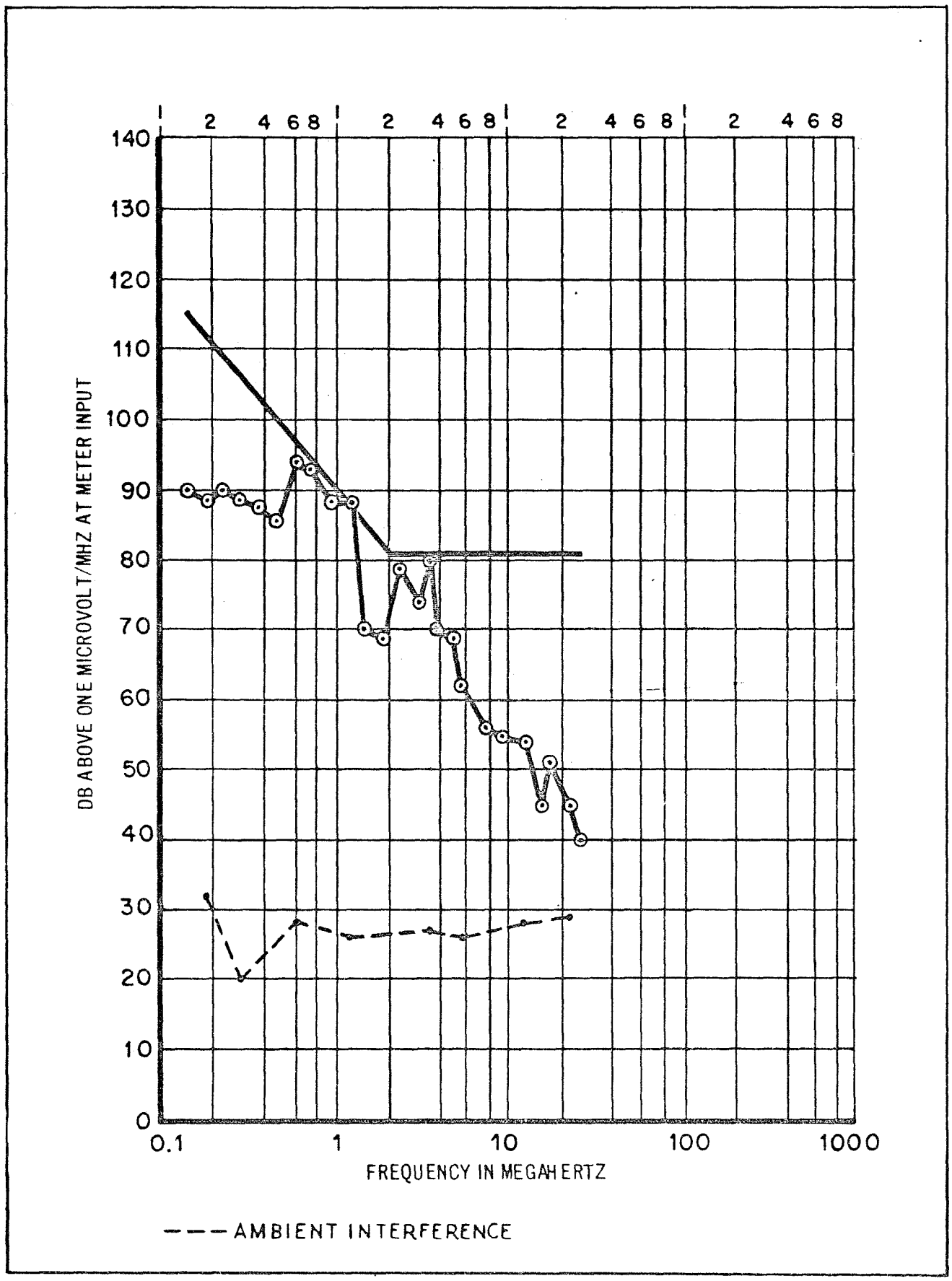

Figure 5–12. Model DSV–4B–125 Test Results
Broad Band Steady State Conducted Interference,
J3 (Pin "D"), 115 VAC, 400 Cycles, C Ø Return Line

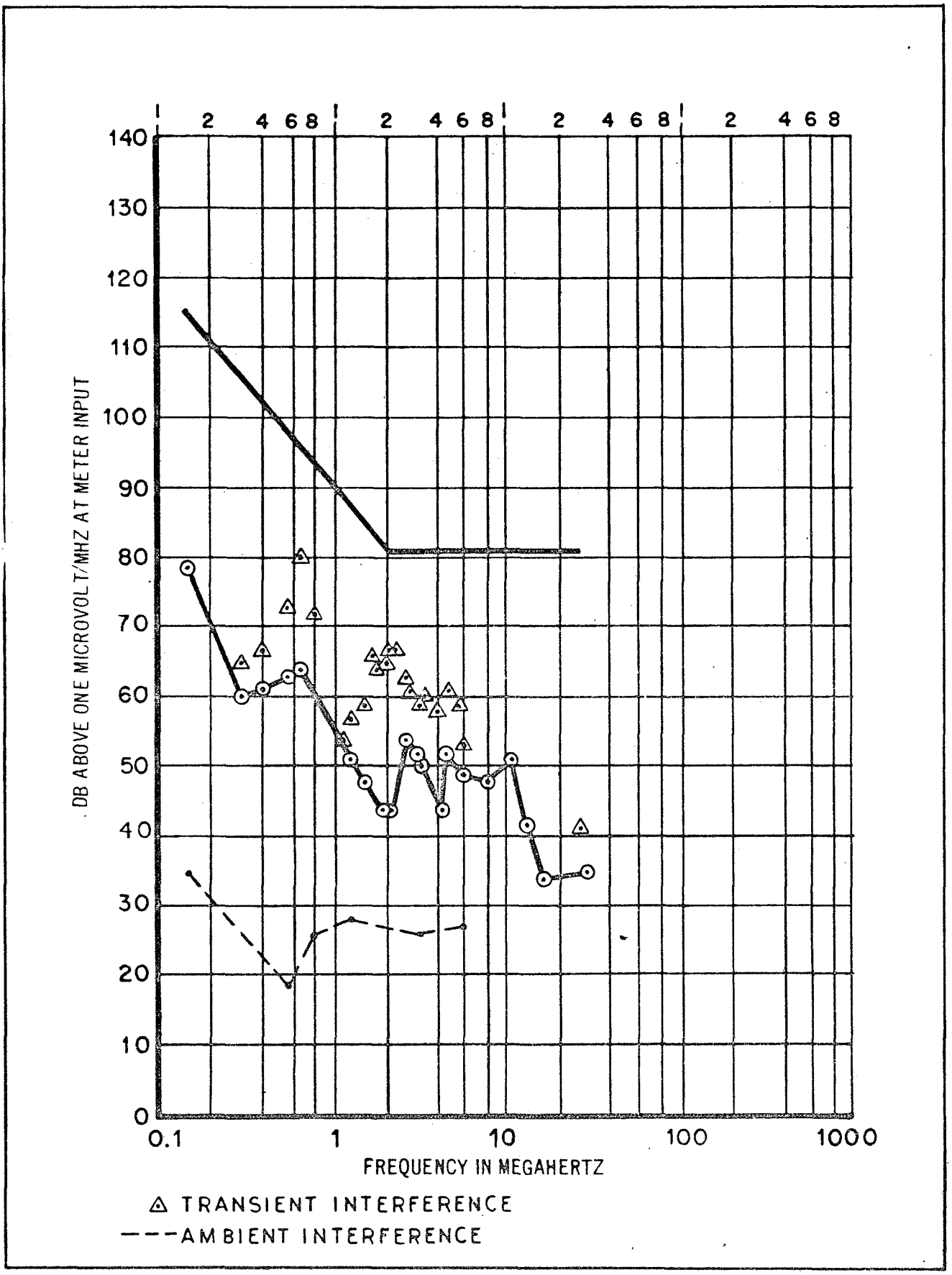

Figure 5–13. Model DSV–4B–125 Test Results
Broad Band Steady State Interference, J1 (Pin "B"),
115 VAC, 60 Cycles, Input Power Line

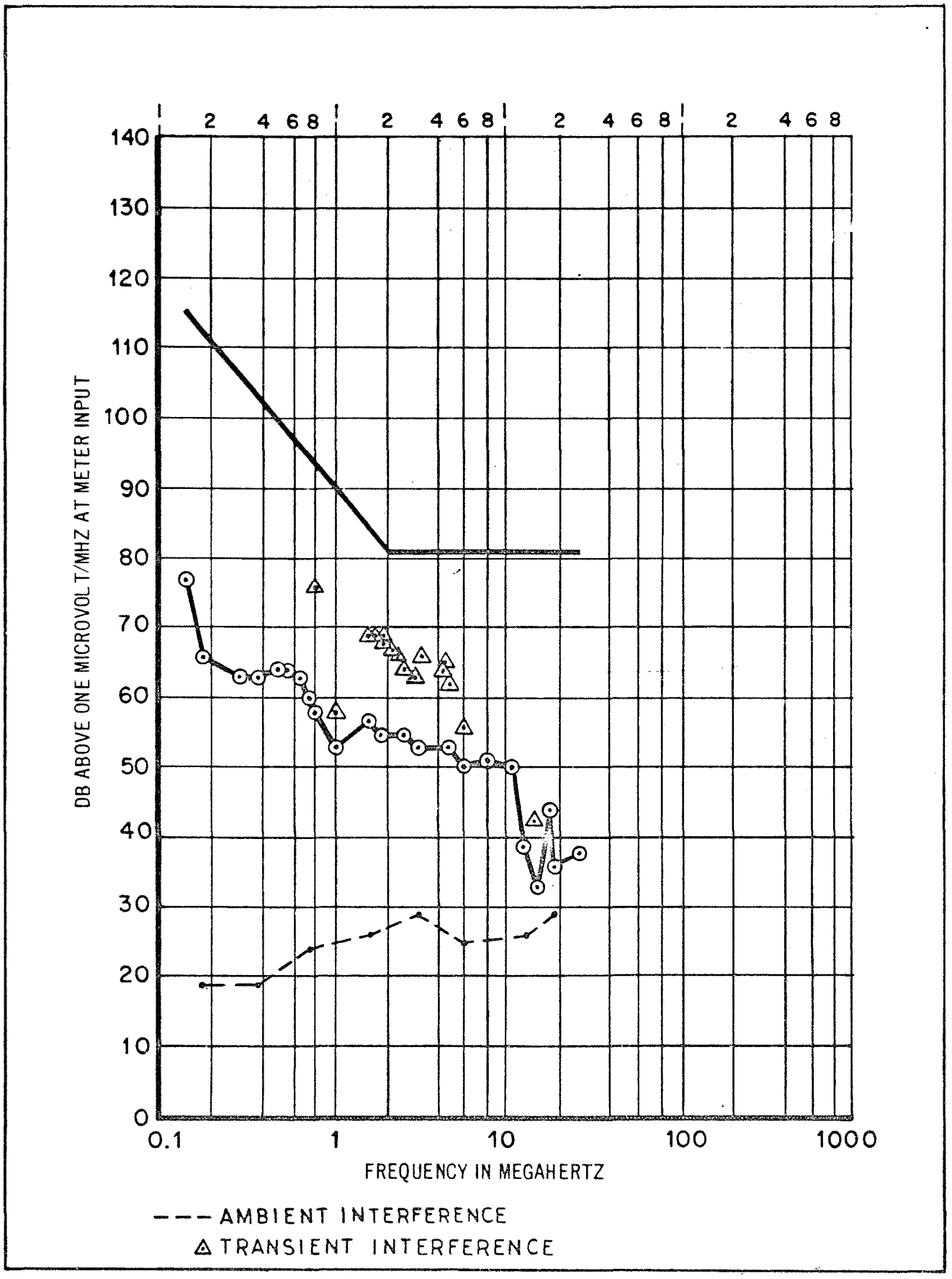

Figure 5–14. Model DSV–4B–125 Test Results
Broad Band Conducted Interference, J1 (Pin "D"),
60 Cycles, Return Line

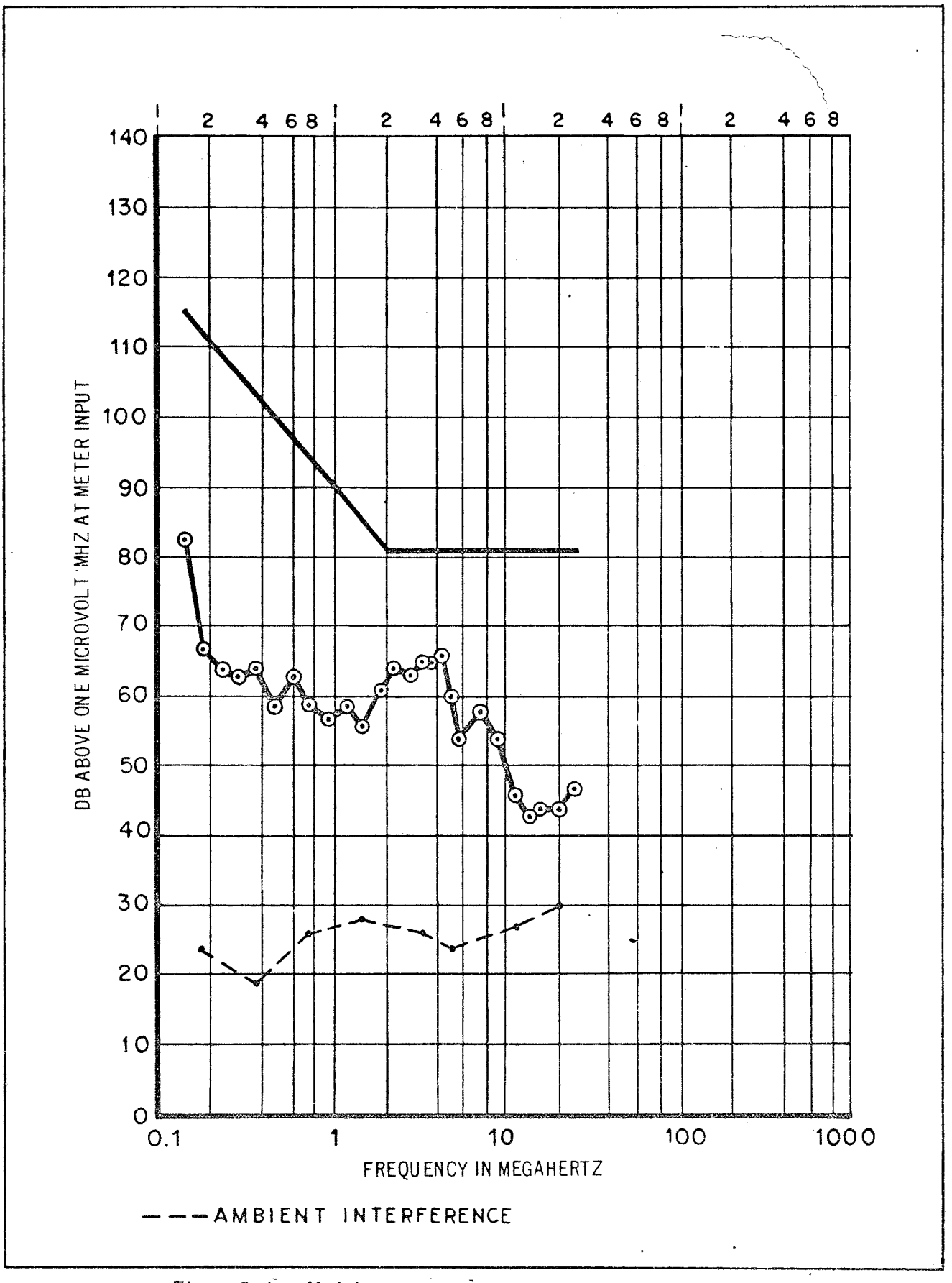

Figure 5–15. Model DSV–4B–125 Test Results
Broad Band Conducted Interference, J2 (Pin "C"),
115 VAC, 60 Cycles Input Power Line

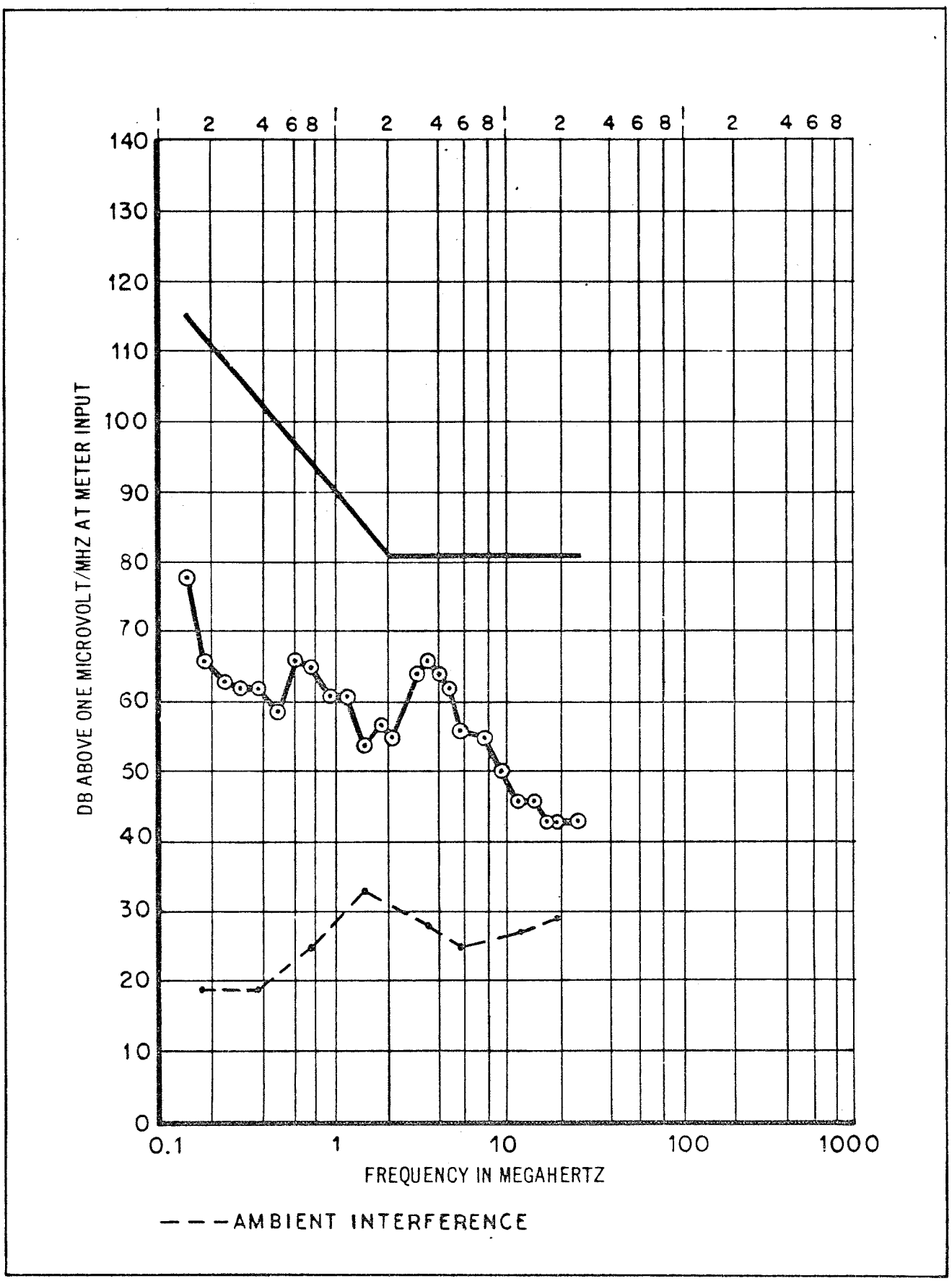

Figure 5–16. Model DSV–4B–125 Test Results
Broad Band Conducted Interference, J2 (Pin "D"),
115 VAC, 60 Cycles Return Line

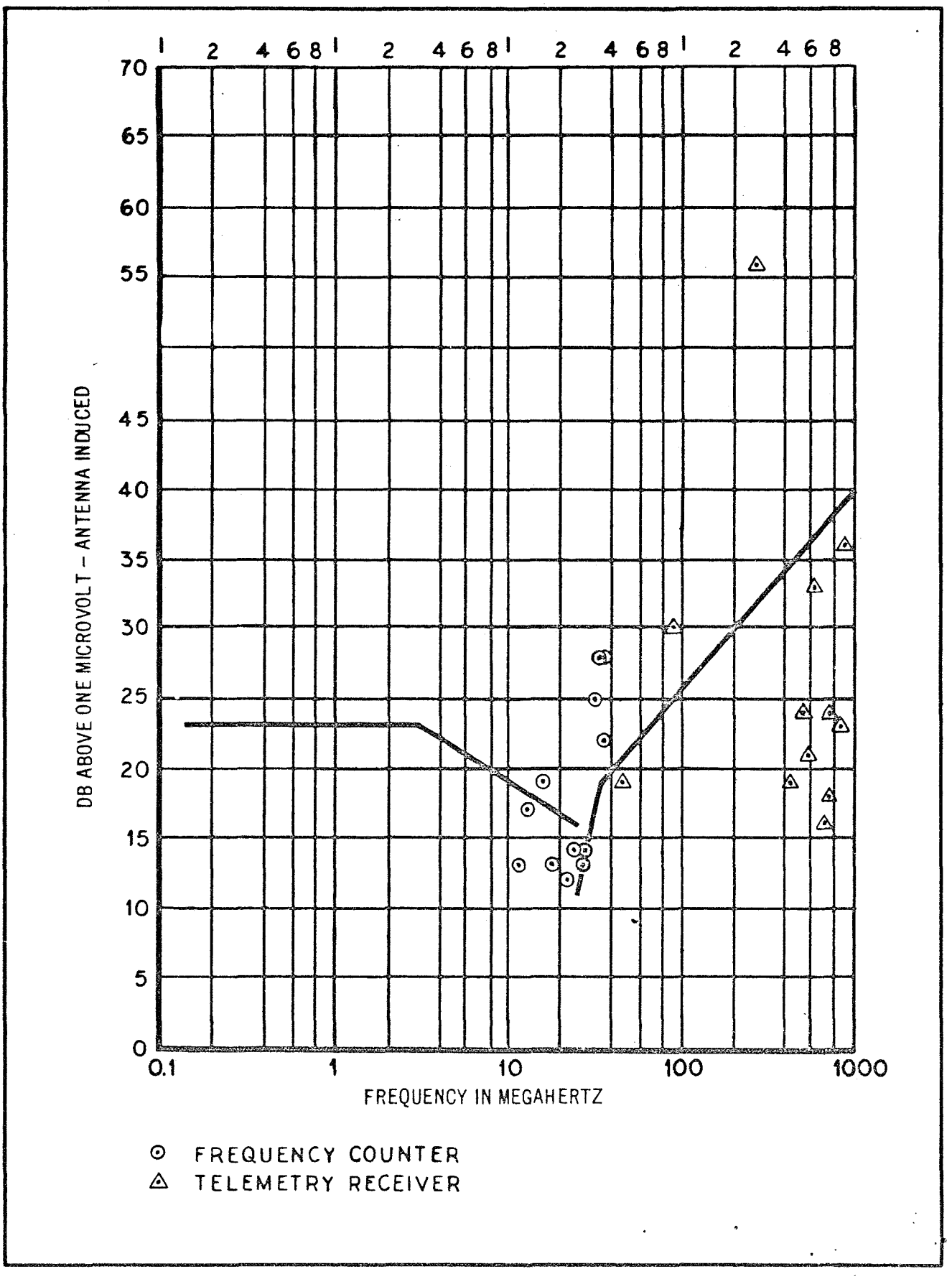

Figure 5–17. Model DSV–4B–125 Test Results
Narrow Band Radiated Interference

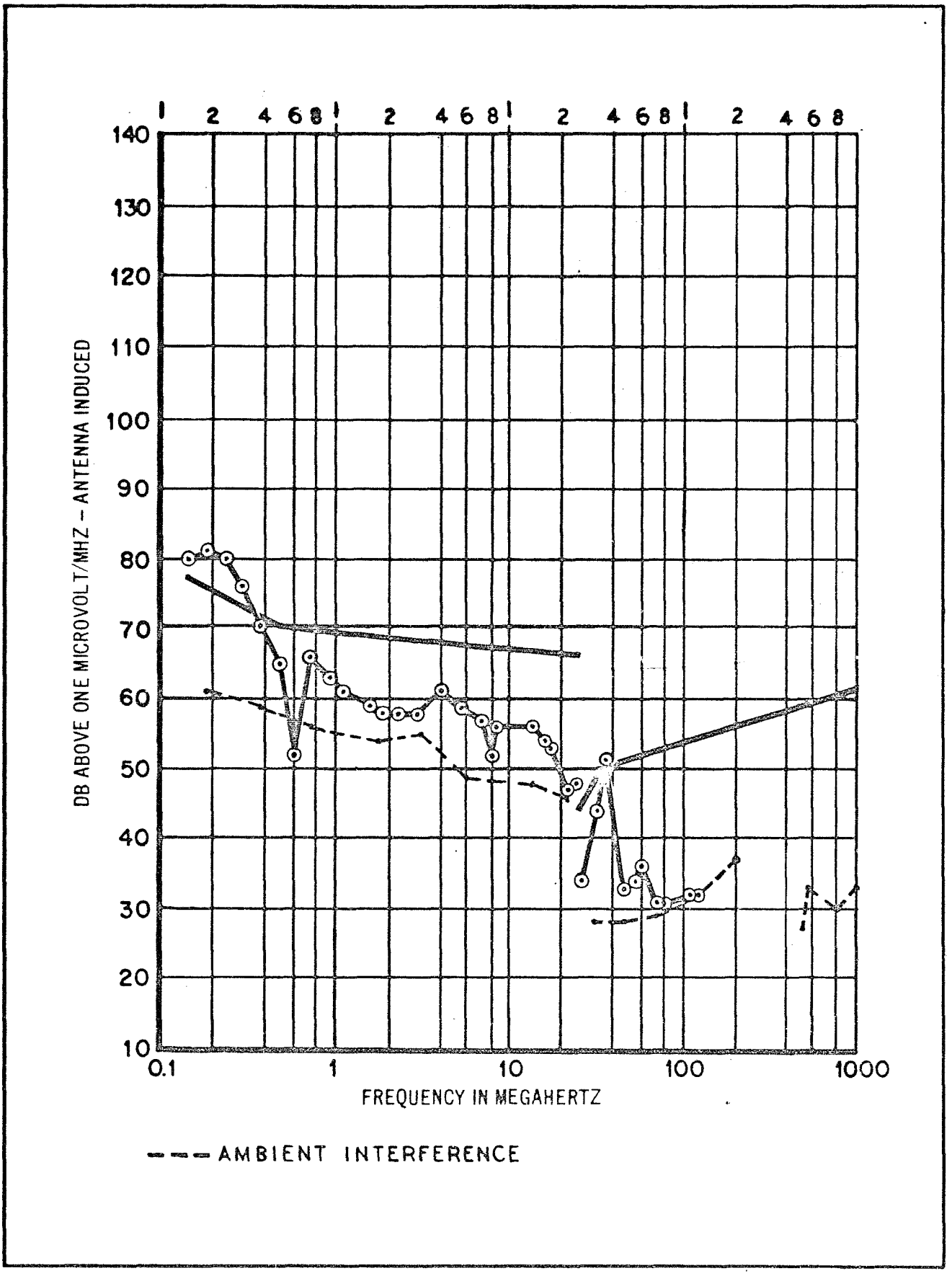

Figure 5–18. Model DSV–4B–125 Test Results
Broad Band Steady Radiated Interference
126

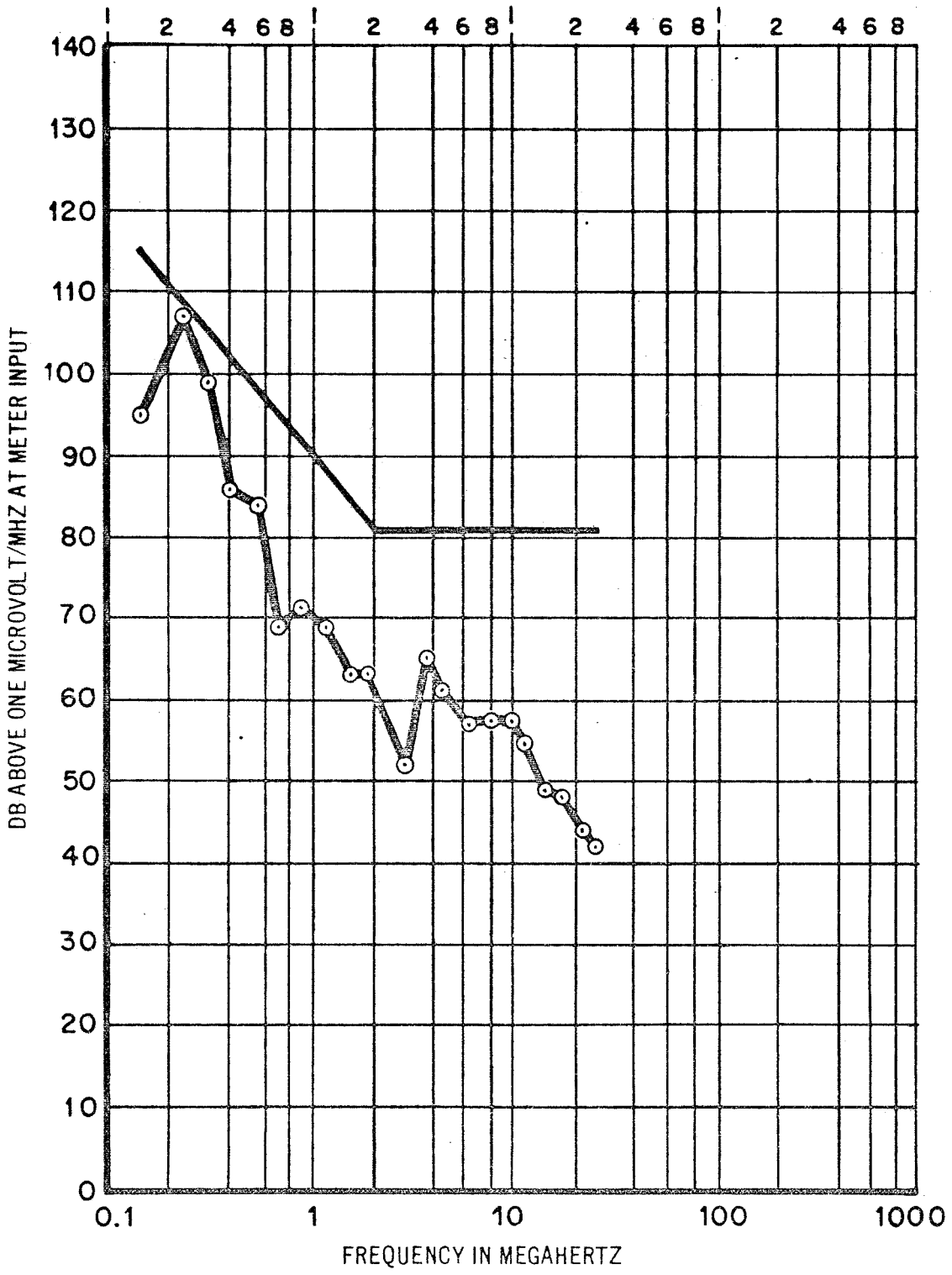

Figure 6–1. Model DSV–4B–126 Test Results
Broad Band and Pulsed (cw) Conducted Interference, 115 VAC, 60 Cycle, Return Line (All Equipment ON and Console Doors Open)

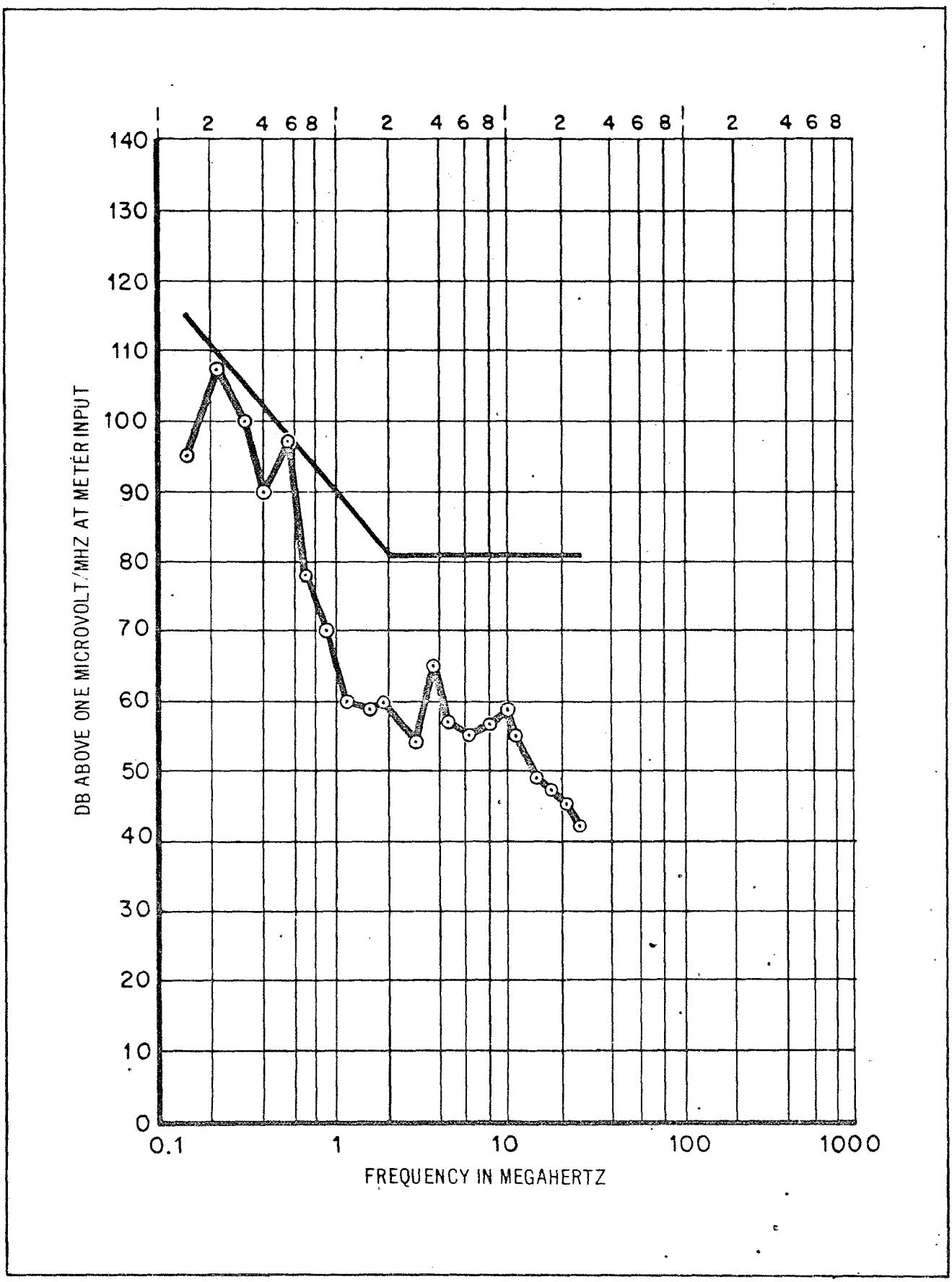

Figure 6–2. Model DSV–4B–126 Test Results
Broad Band and Pulsed (cw) Conducted Interference, 115 VAC, 60 Cycles Input Power Line (All Equipment ON and Console Doors Open)

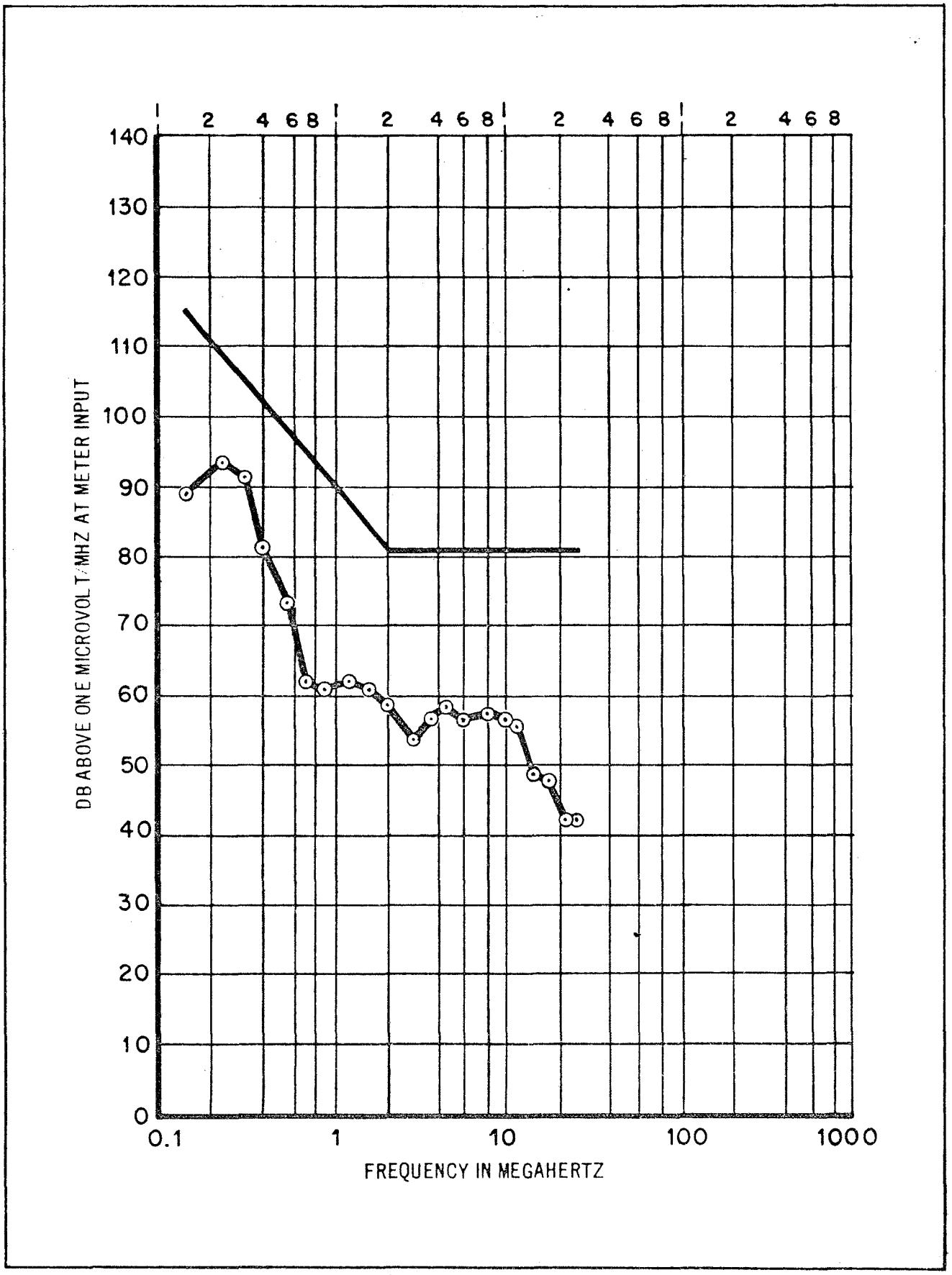

Figure 6–3. Model DSV–4B–126 Test Results
Broad Band and Pulsed (cw) Conducted Interference;
115 VAC, 60 Cycles, Return Line (Receiver and Demultiplexer
ON and Console Doors Closed)

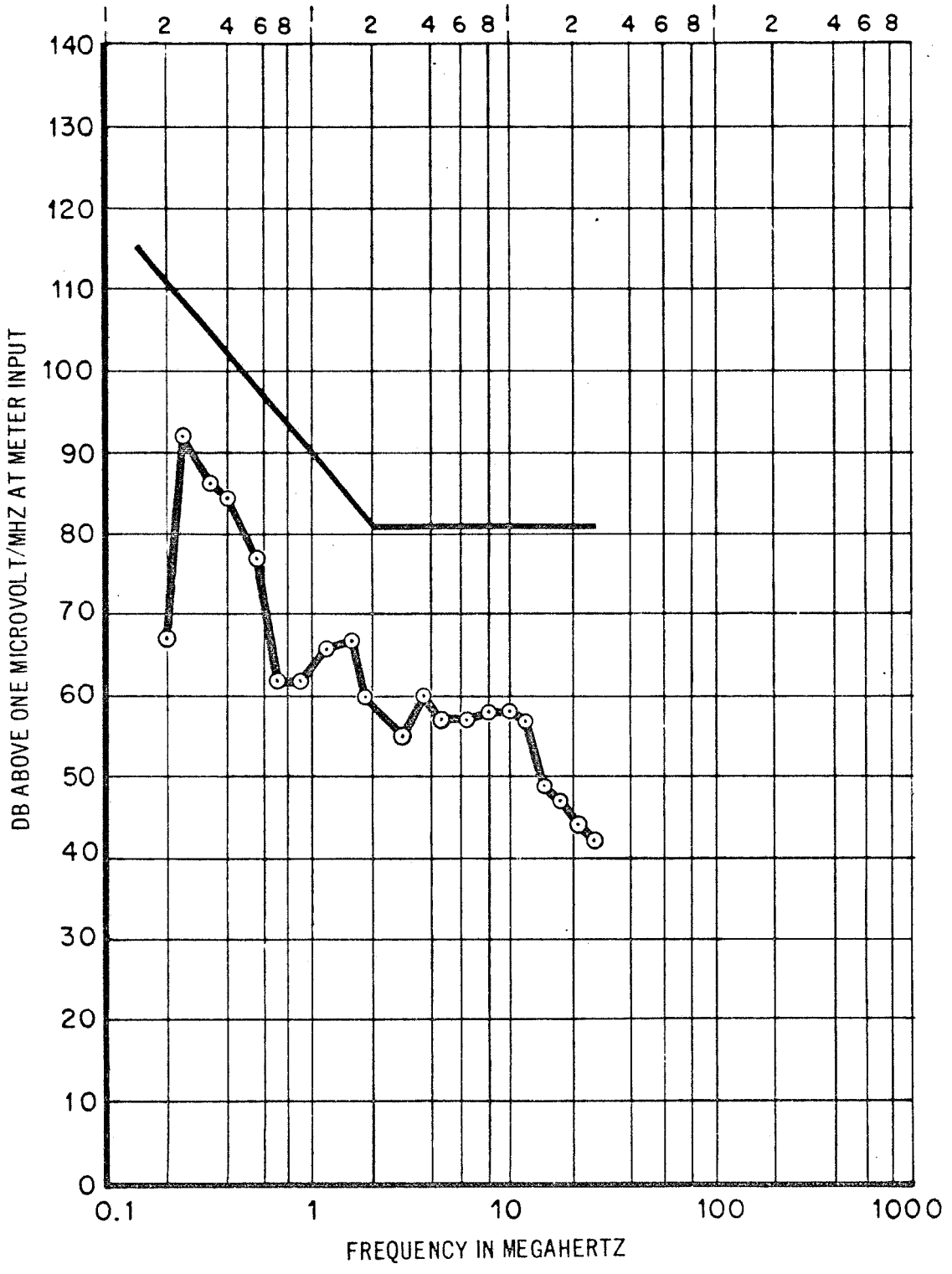

Figure 6–4. Model DSV–4B–126 Test Results
Broad Band and Pulsed (cw) Conducted Interference,
115 VAC, 60 Cycle Input Power Line (Receiver and
Demultiplexer ON and Console Doors Closed)

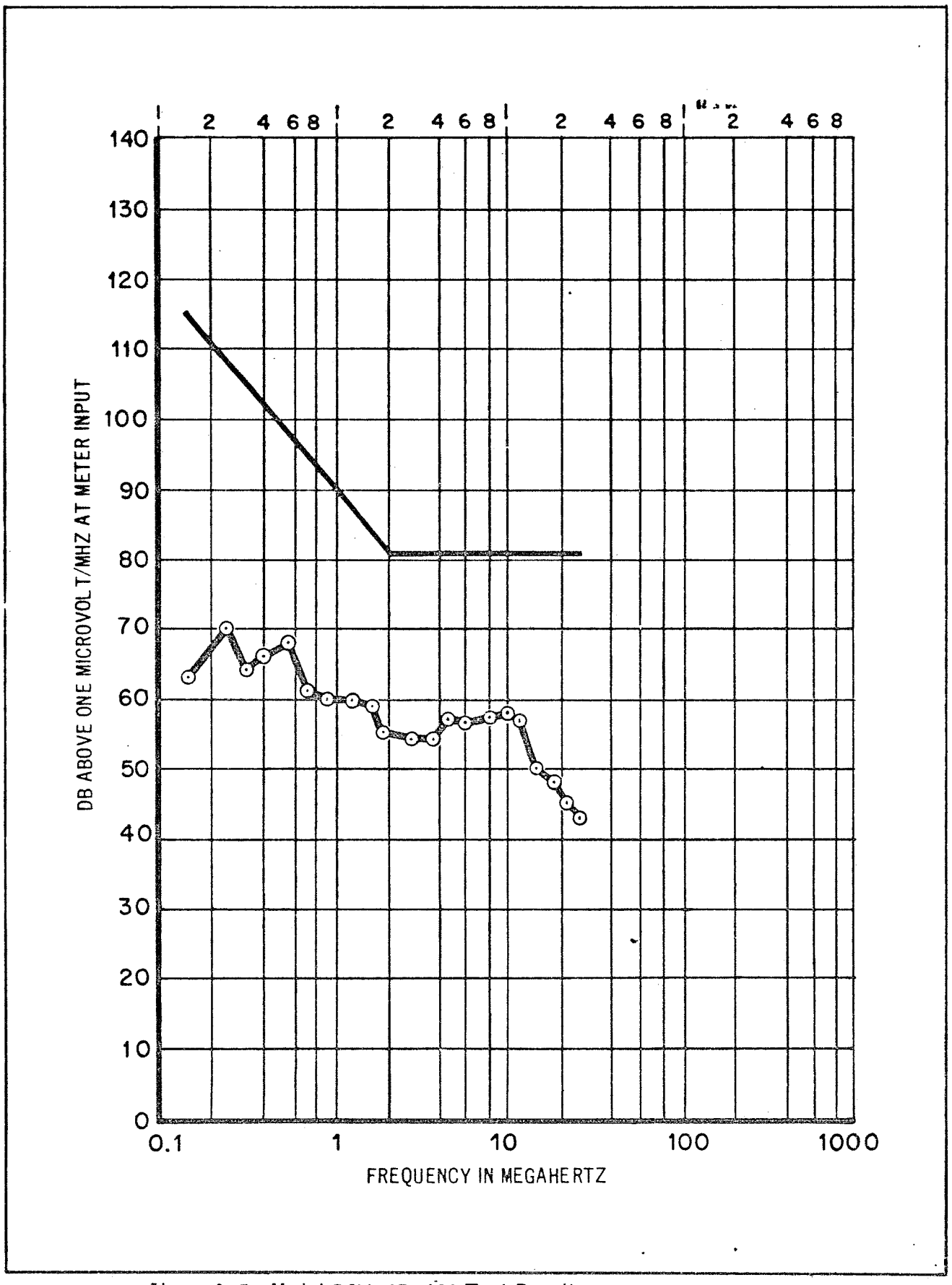

Figure 6–5. Model DSV–4B–126 Test Results
Broad Band and Pulsed (cw) Conducted Interference, 28 VDC, Power Line (Receiver and Demultiplexer ON and Console Doors Closed)

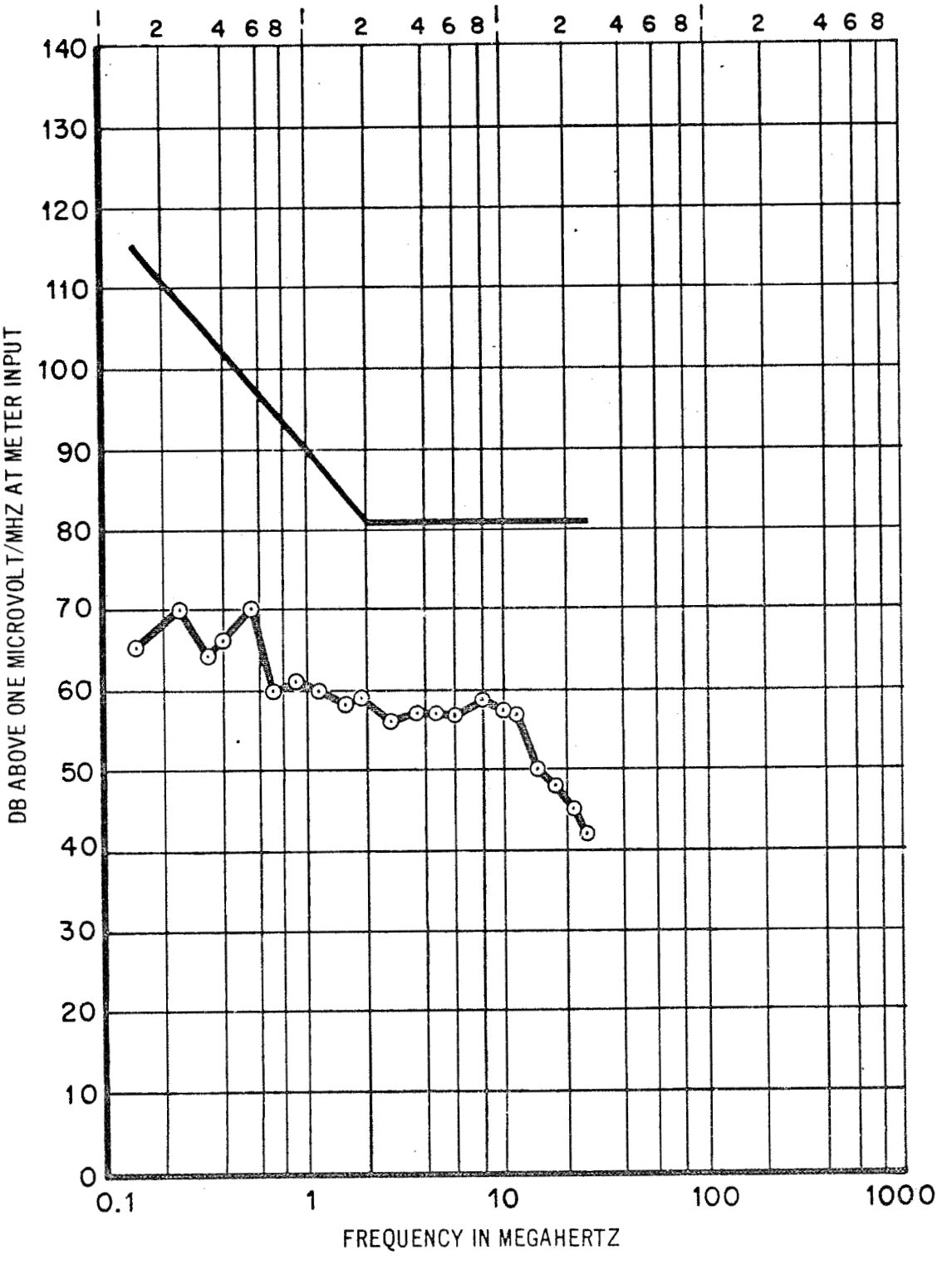

Figure 6–6. Model DSV–4B–126 Test Results
Broad Band and Pulsed (cw) Conducted Interference,
28 VDC Return Line (Receiver and Demultiplexer ON
and Console Doors Closed)

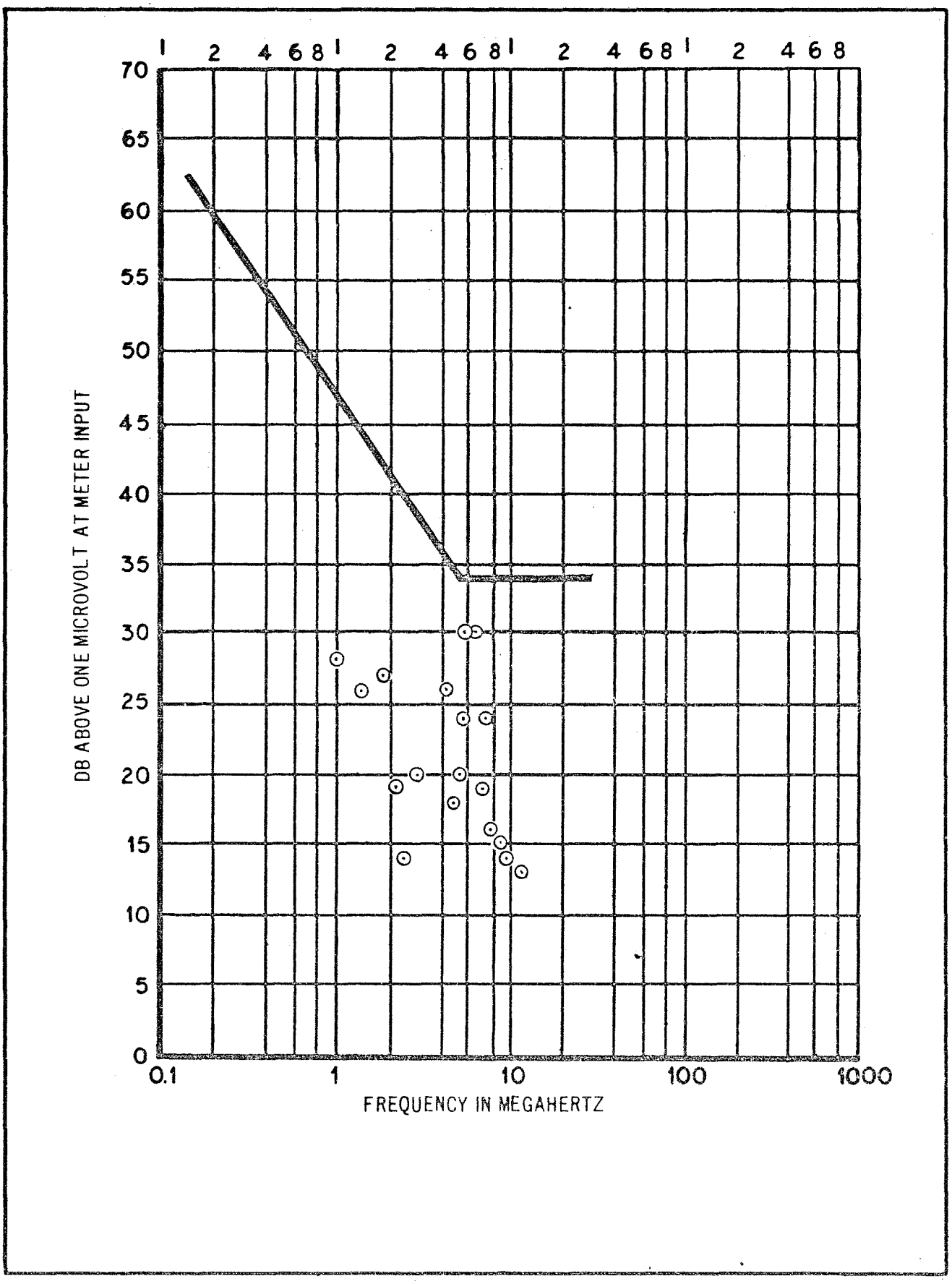

Figure 6–7. Model DSV–4B–126 Test Results
Narrow Band (cw) Conducted Interference, 115 VAC, 60 Cycle Input Power Line (All Equipment ON and Console Doors Open)

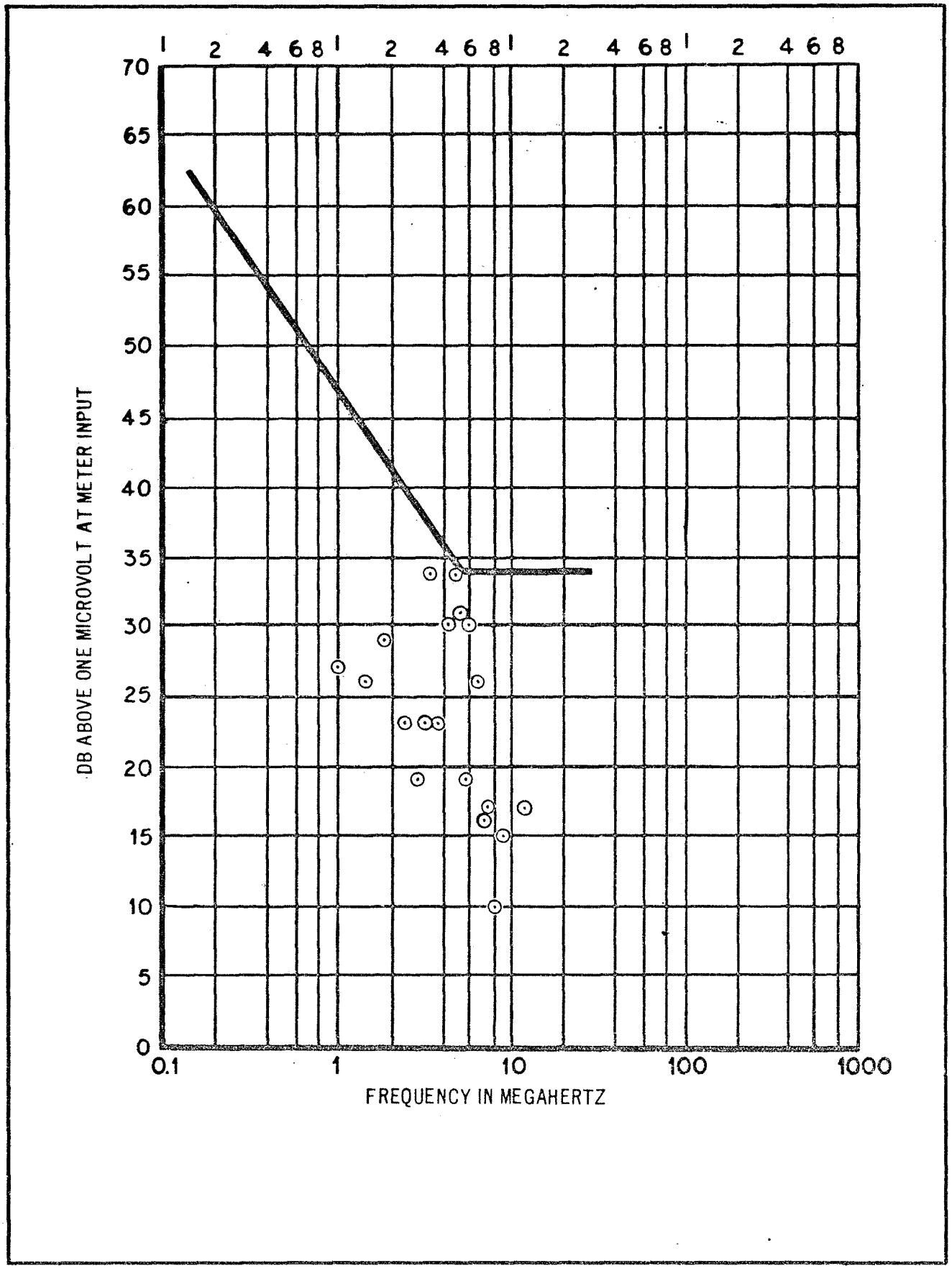

Figure 6–8. Model DSV–4B–126 Test Results
Narrow Band (cw) Conducted Interference, 115 VAC, 60 Cycle Return Line (All Equipment ON and Console Doors Open)

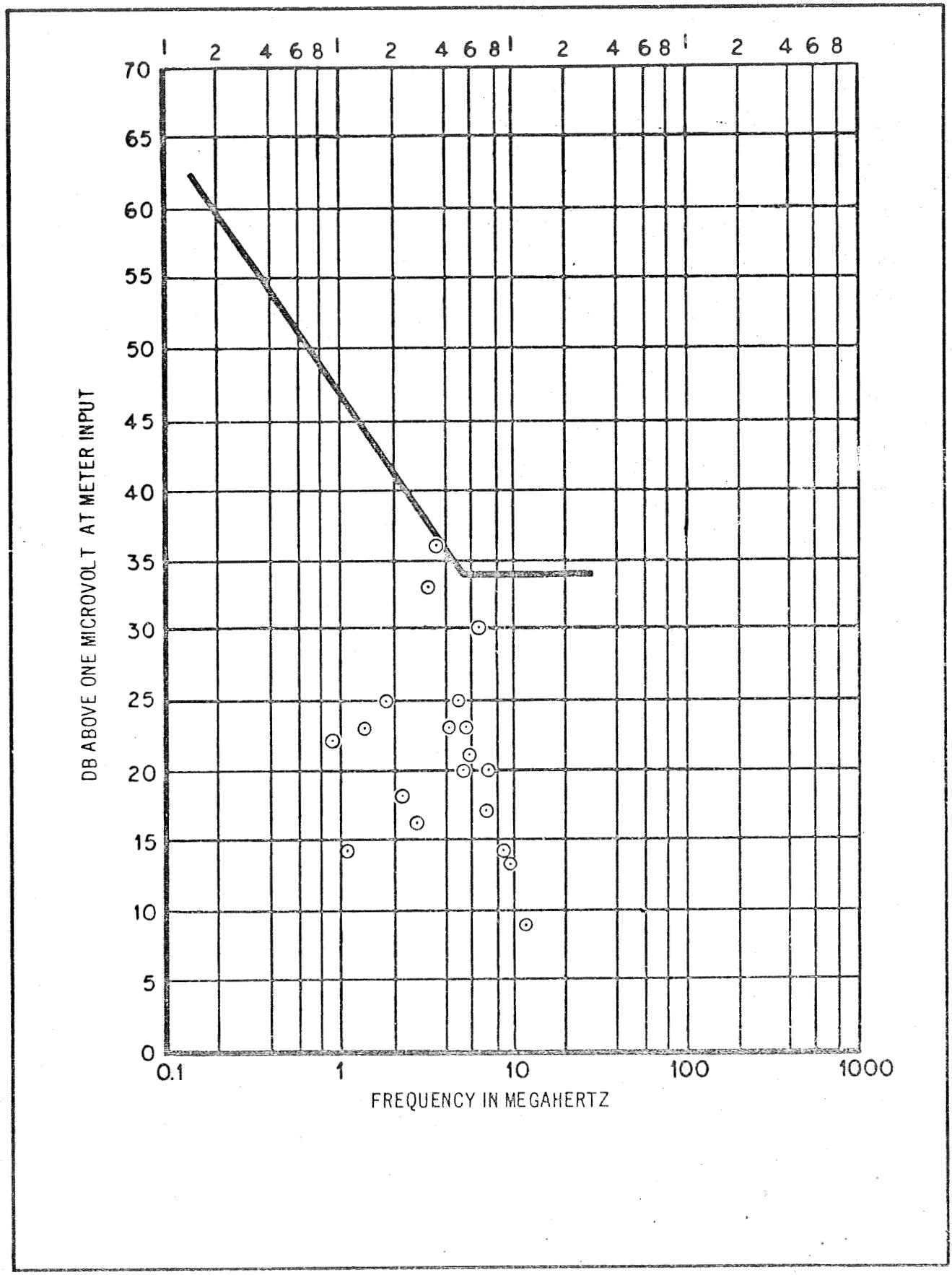

Figure 6–9. Model DSV–4B–126 Test Results
Narrow Band (cw) Conducted Interference, 115 VAC,
60 Cycle Input Power Line (Receiver and Demultiplexer
ON and Console Doors Closed)

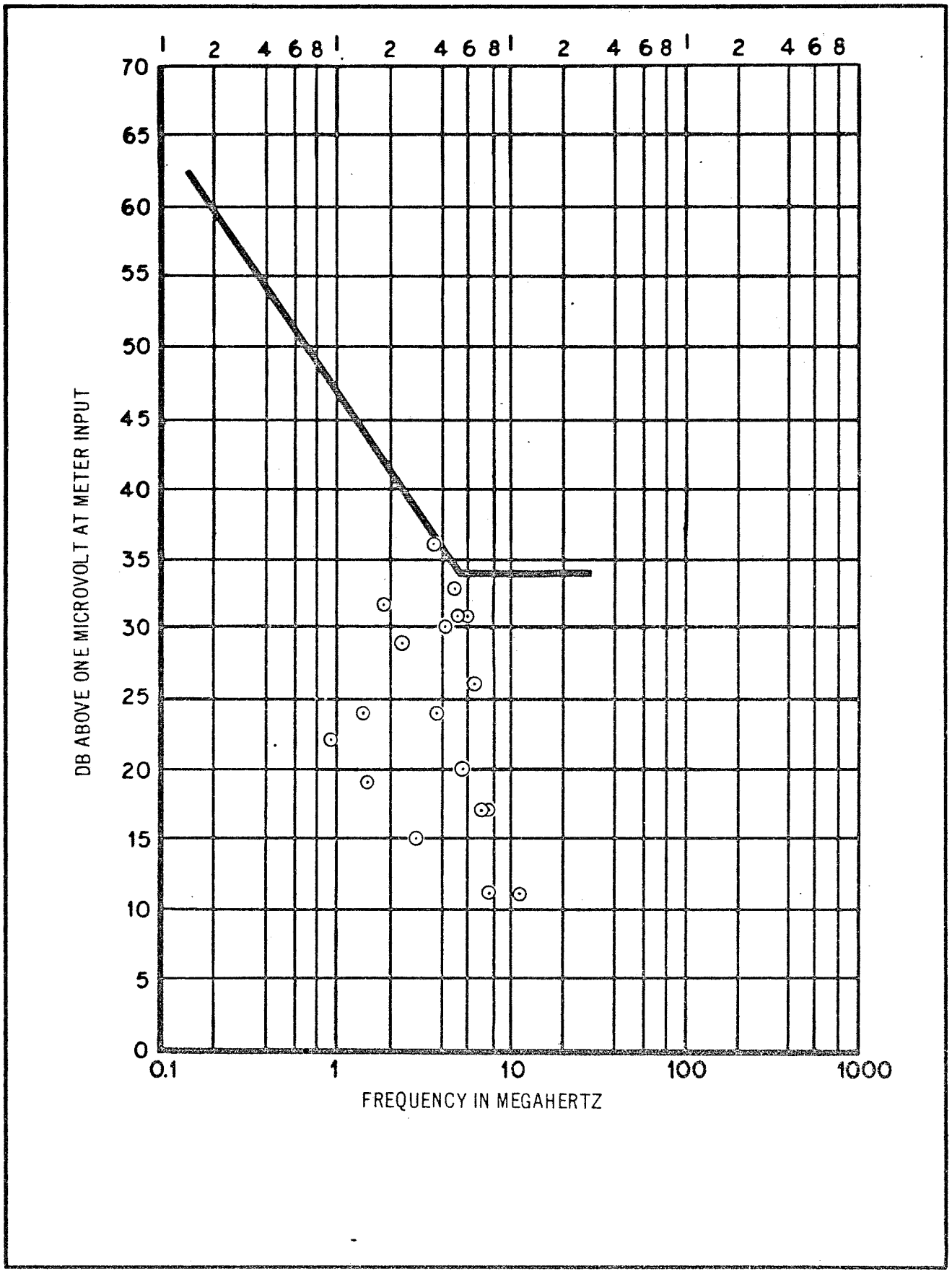

Figure 6–10. Model DSV–4B–126 Test Results
Narrow Band (cw) Conducted Interference, 115 VAC,
60 Cycle Return Line (Receiver and Demultiplexer
ON and Console Doors Closed)

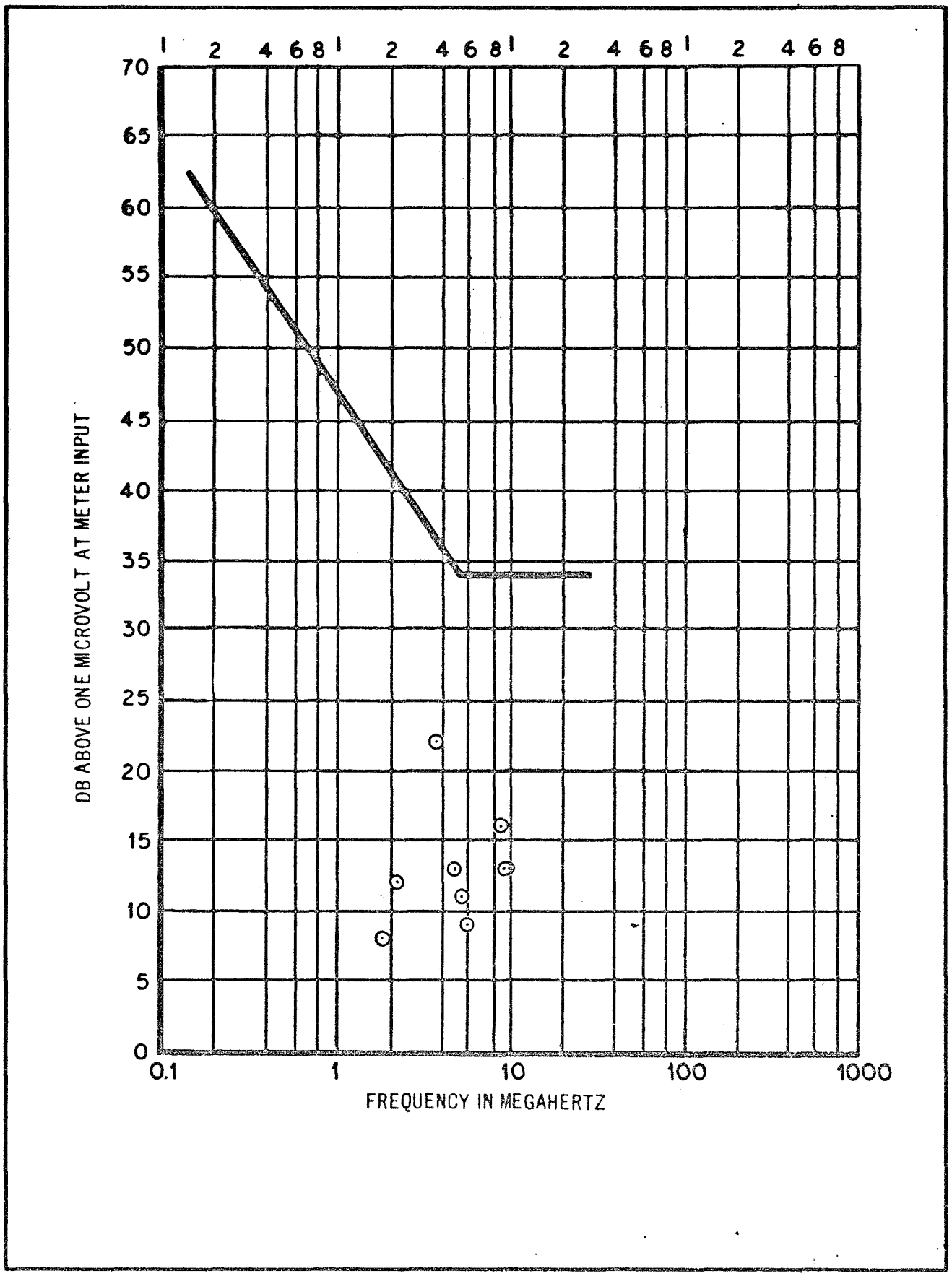

Figure 6–11. Model DSV–4B–126 Test Results
Narrow Band (cw) Conducted Interference, 28 VDC
Power Line (Receiver and Demutiplexer ON and
Console Doors Closed)

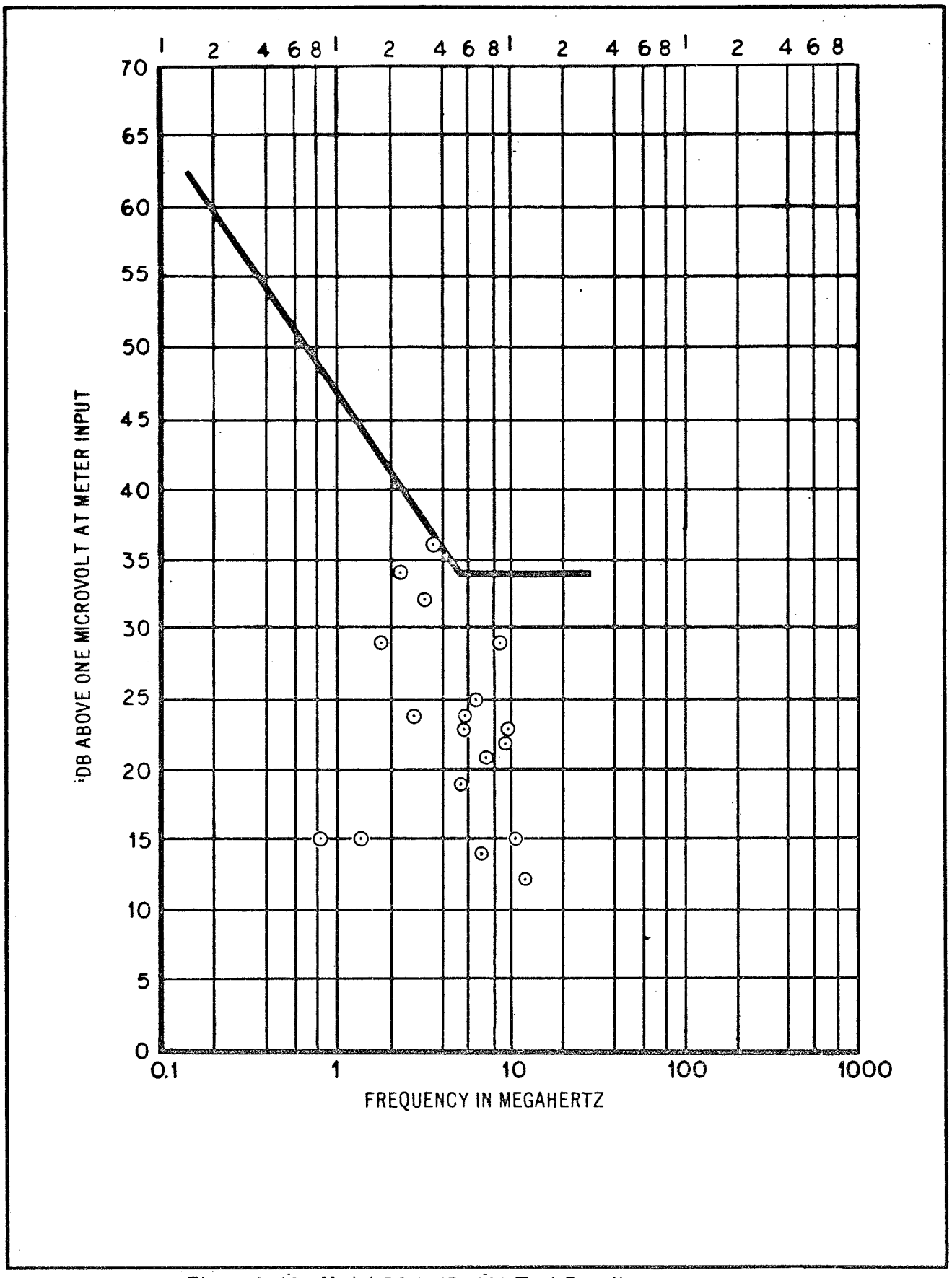

Figure 6–12. Model DSV–4B–126 Test Results
Narrow Band (cw) Conducted Interference, 28 VDC
Power Line (Receiver and Demultiplexer ON and
Console Doors Closed)

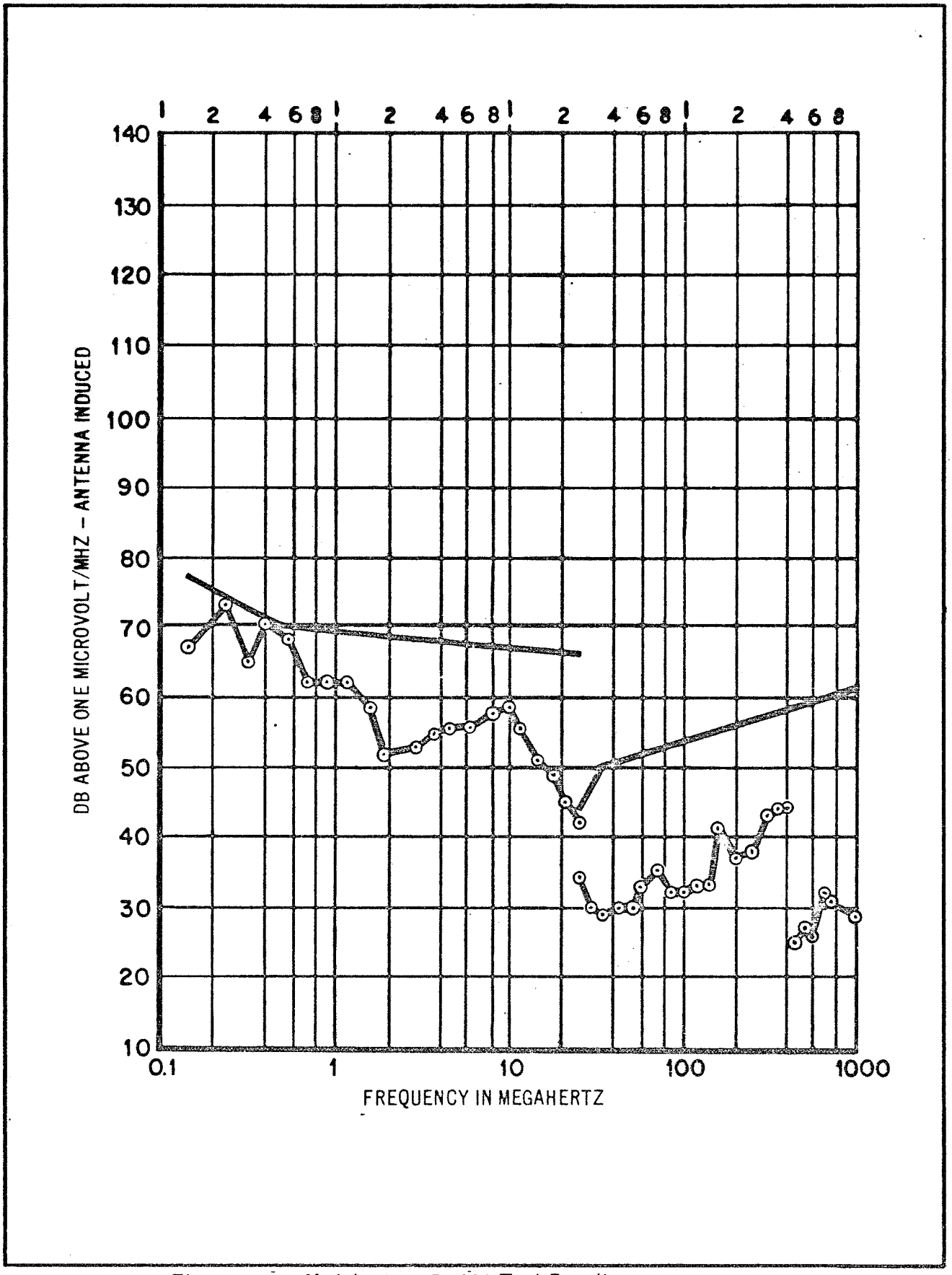

Figure 6–13. Model DSV–4B–126 Test Results
Broad Band and Pulsed (cw) Radiated Interference,
(All Equipment ON and Console Doors Open)

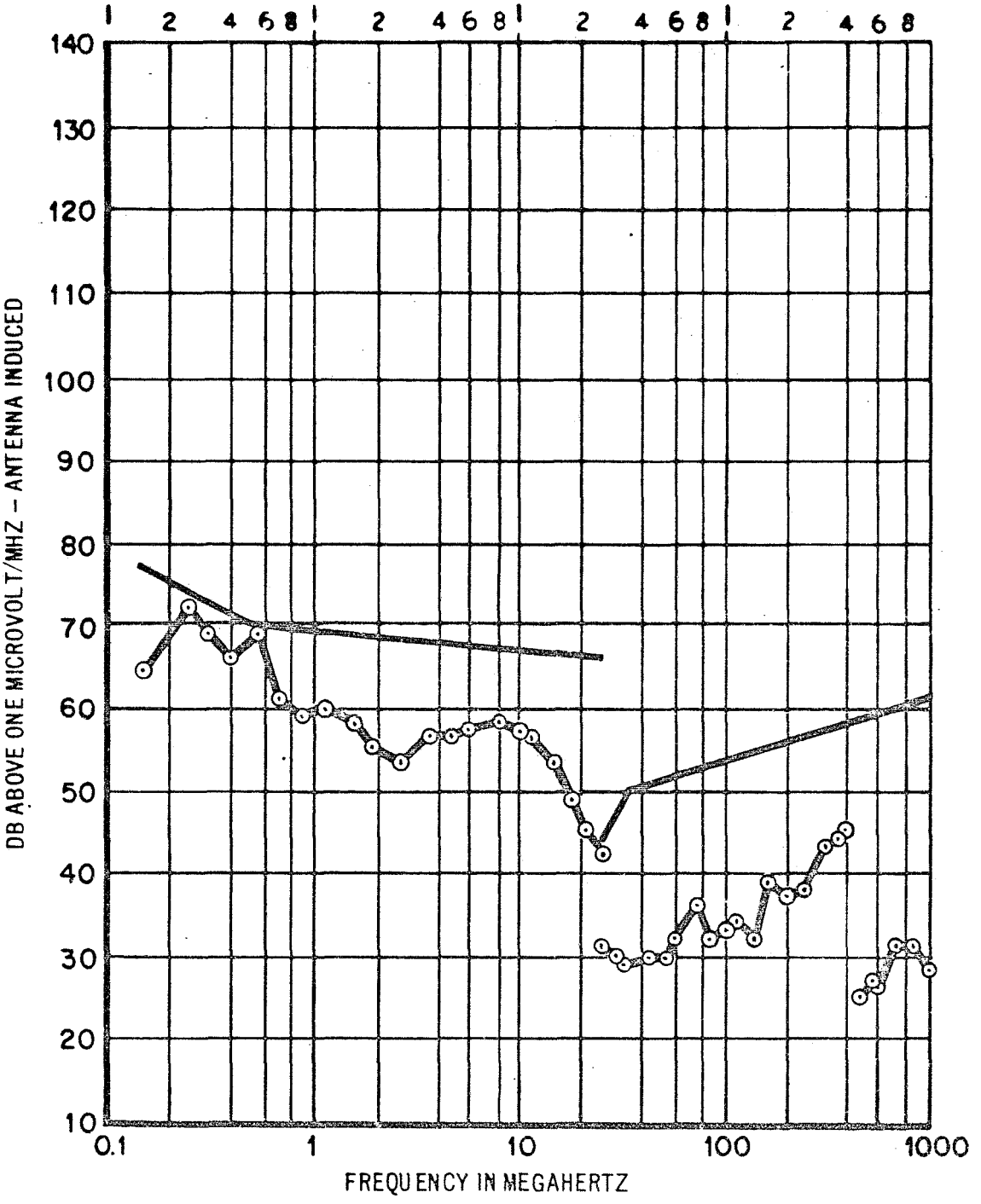

Figure 6–14. Model DSV–4B–126 Test Results
Broad Band and Pulsed (cw) Radiated Interference,
(Receiver and Demultiplexer ON and Console Doors Closed)

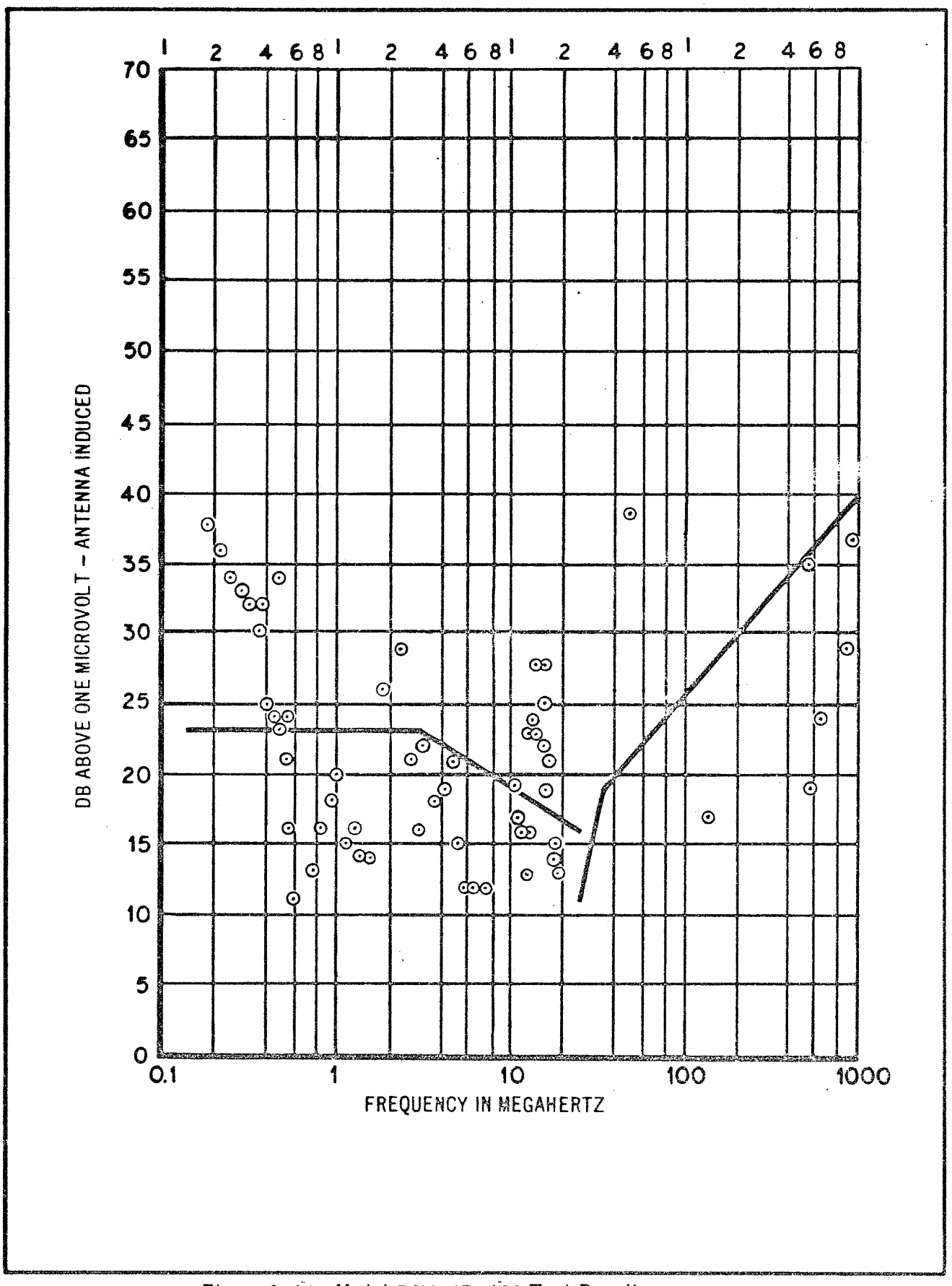

Figure 6–15. Model DSV–4B–126 Test Results
Narrow Band (cw) Radiated Interference, (All Equipment ON and Console Doors Open)

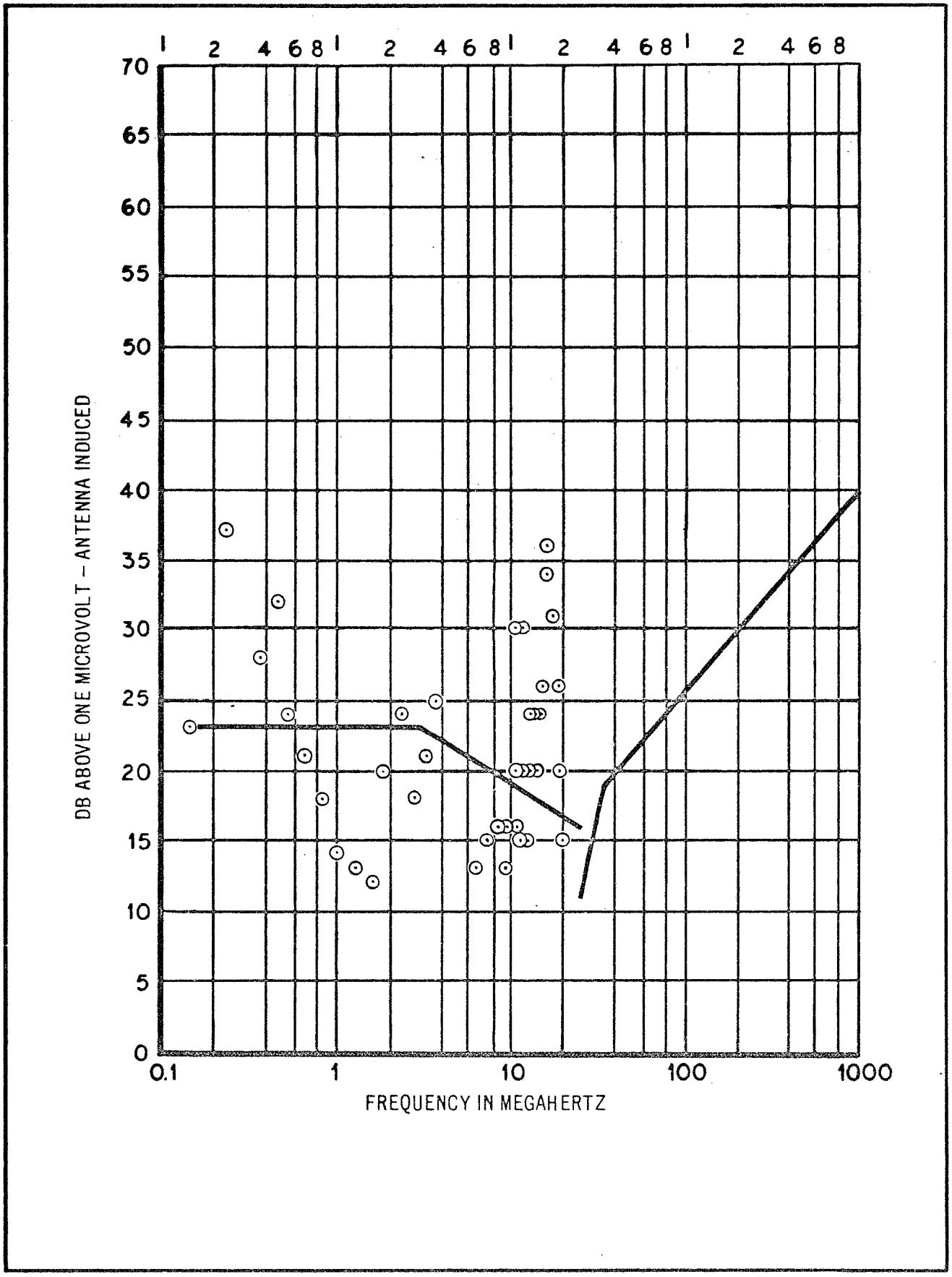

Figure 6–16. Model DSV–4B–126 Test Results
Narrow Band (cw) Radiated Interference, (Receiver and Demultiplexer ON and Console Doors Open)

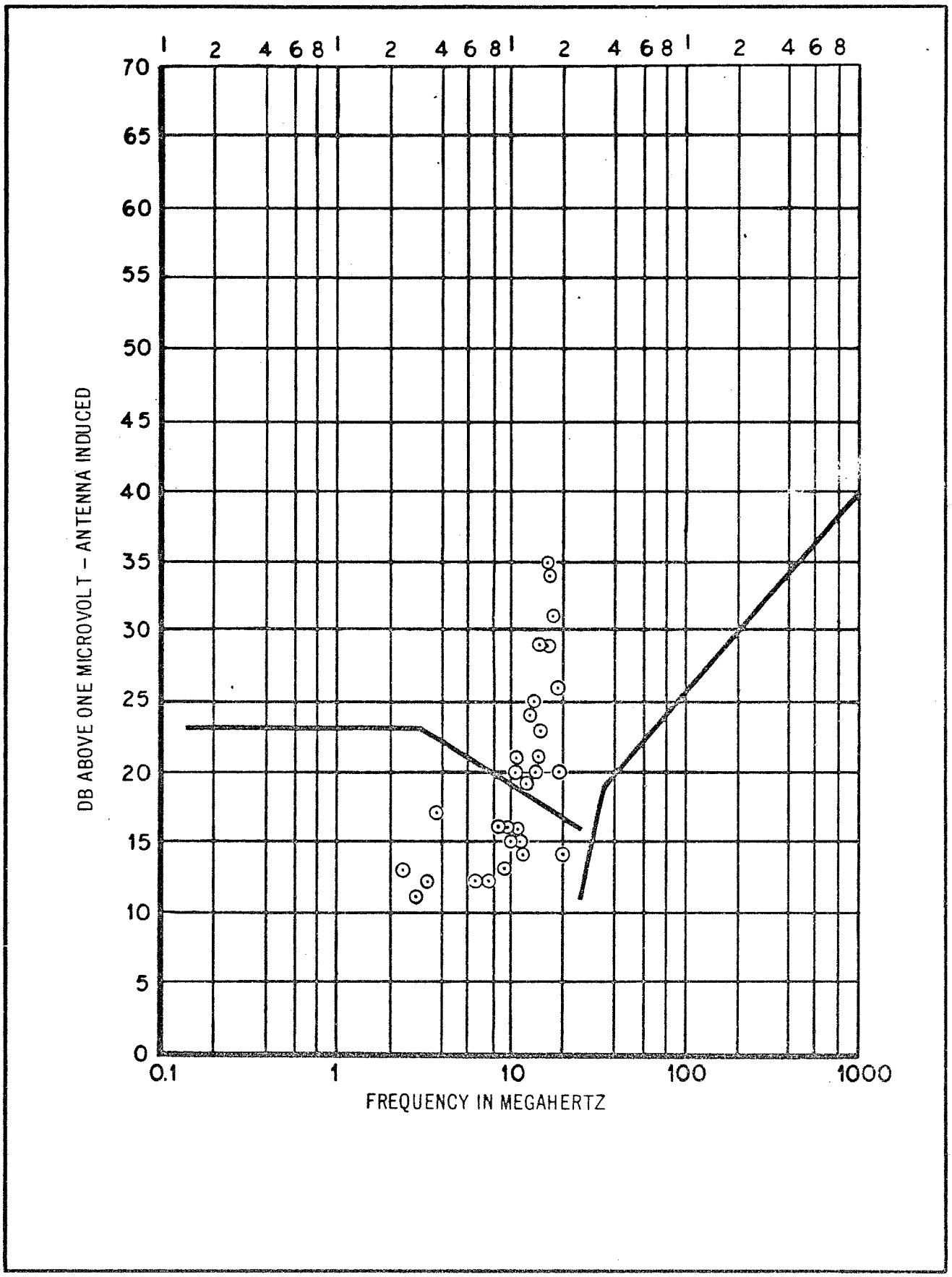

Figure 6–17. Model DSV–4B–126 Test Results
Narrow Band (cw) Radiated Interference, (Receiver and Demultiplexer ON and Console Doors Closed)

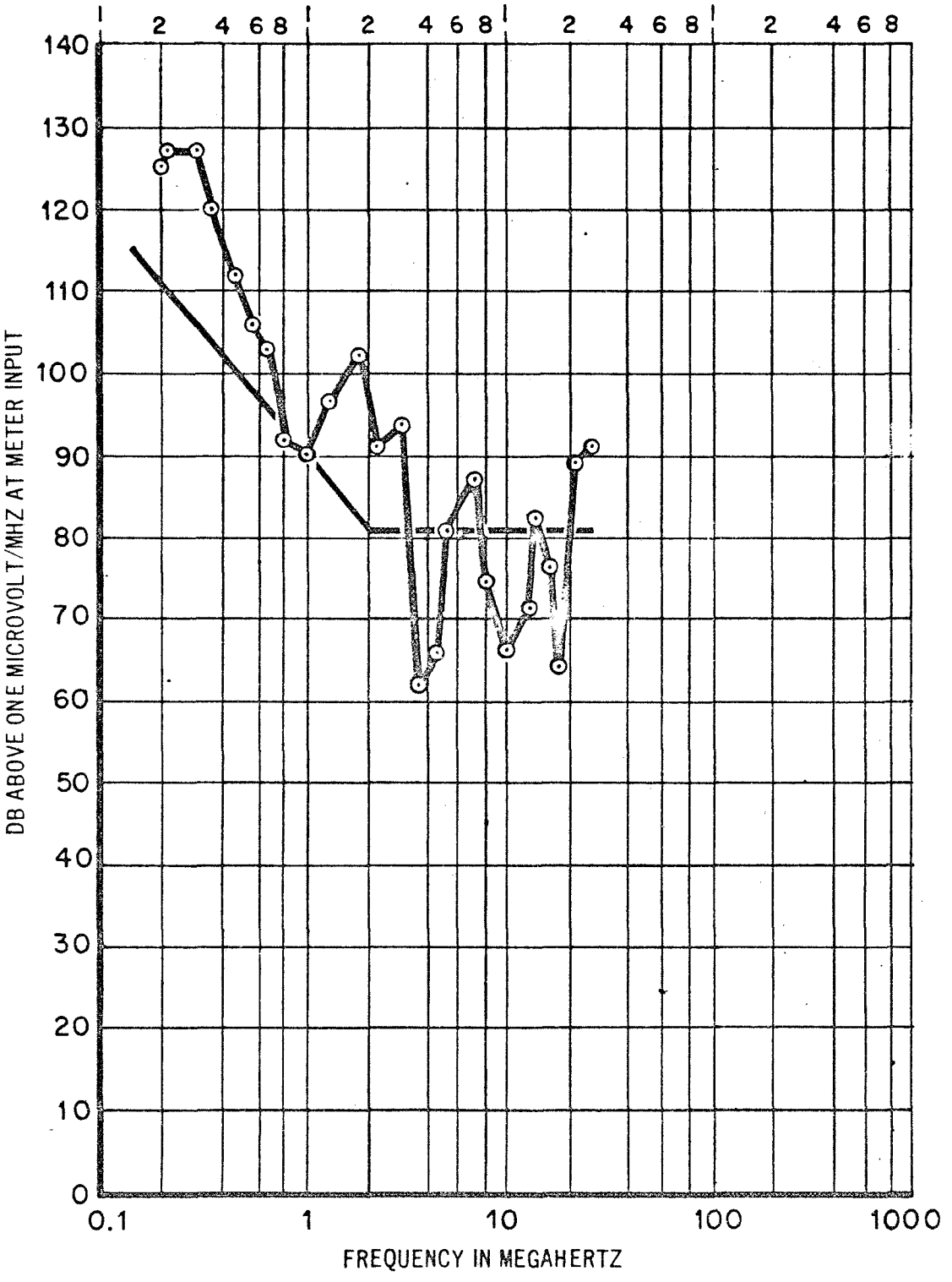

Figure 7–1. Model DSV–4B–127 Test Results
Broad Band Steady State Conducted Interference,
115 VAC, 60 Cycle Input Power Line (No Filters)

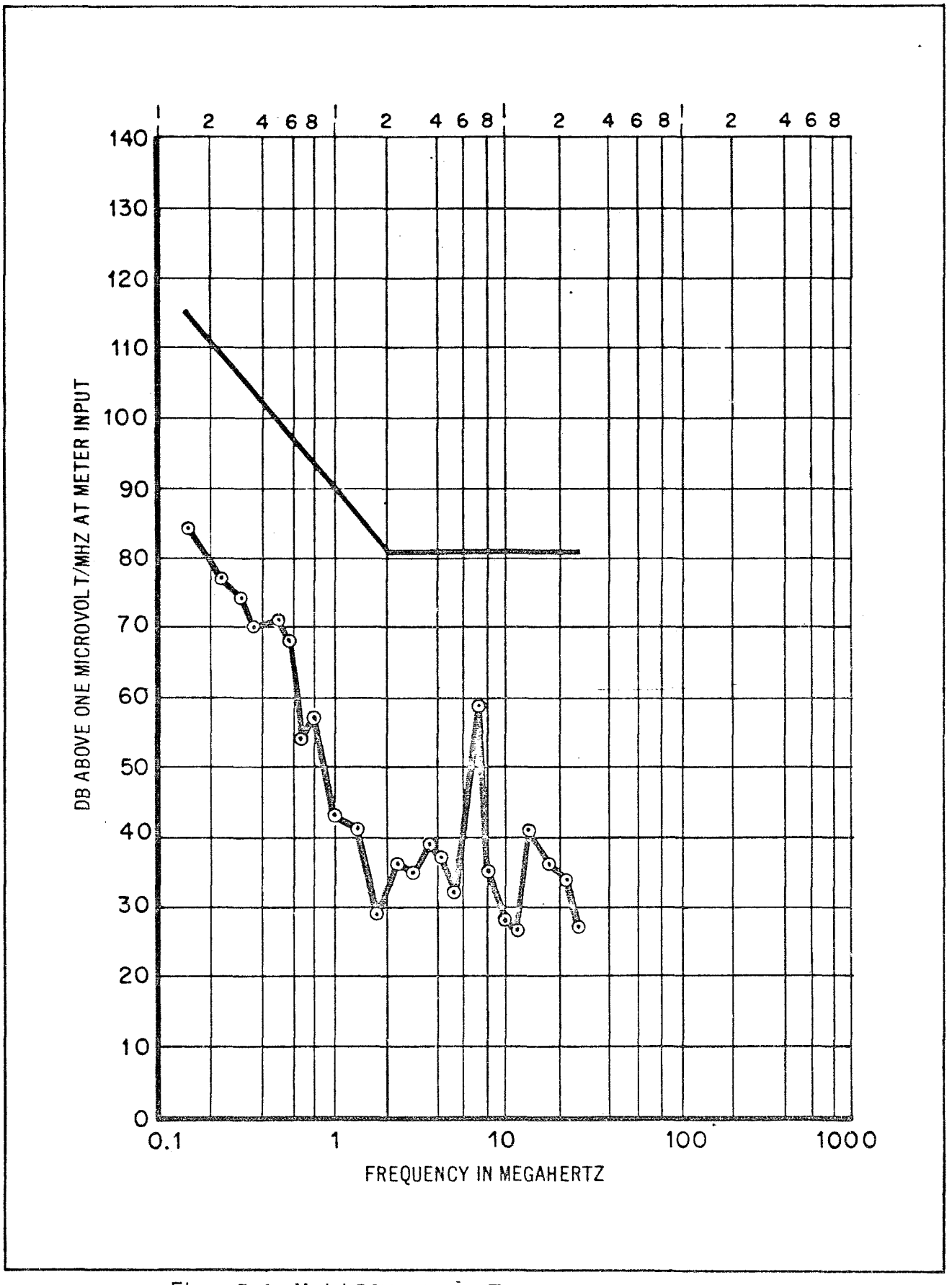

Figure 7–2. Model DSV–4B–127 Test Results
Broad Band S-S Conducted Interference, 115 VAC,
60 Cycle Input Power Line (With Filters)

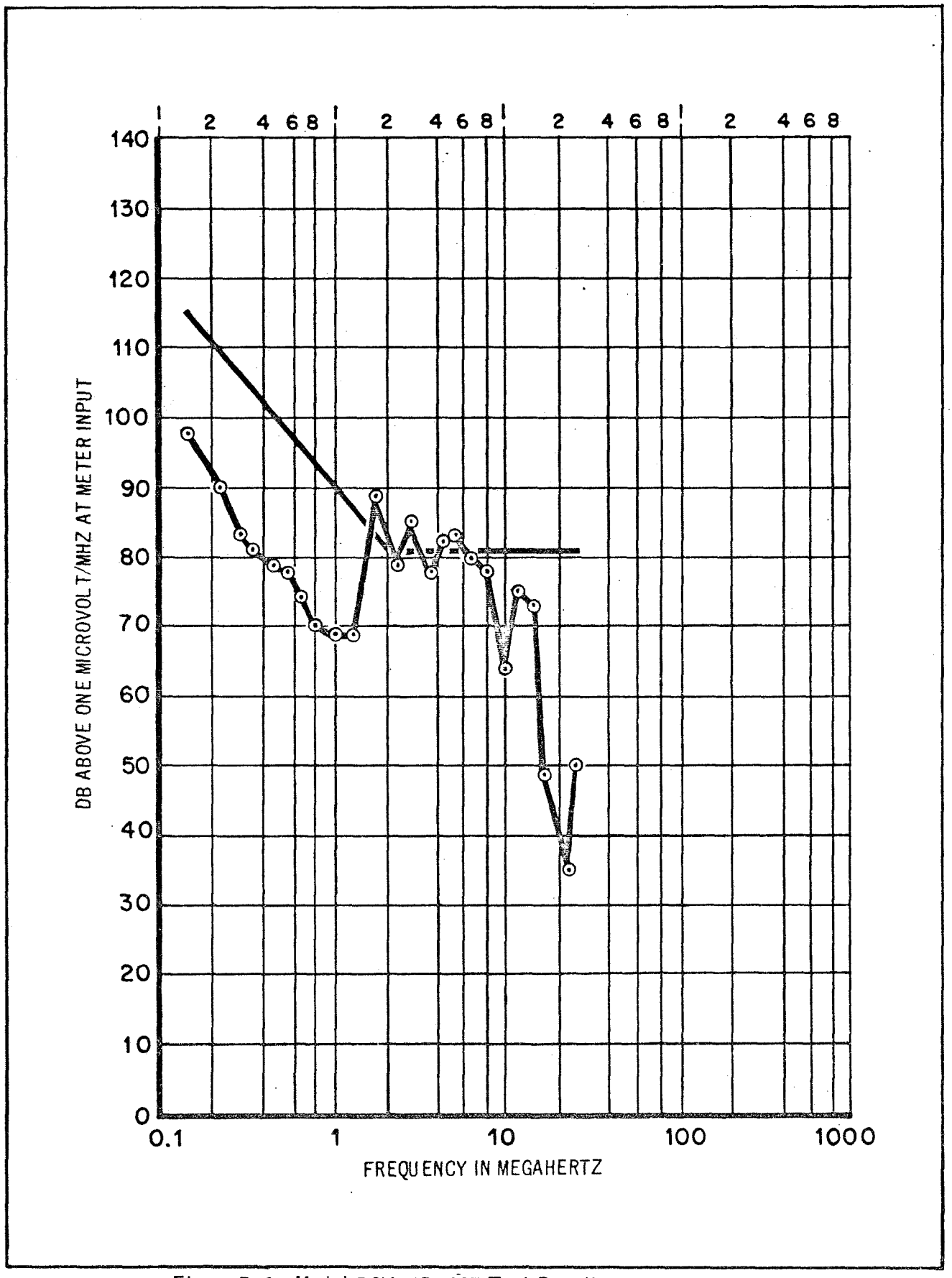

Figure 7–3. Model DSV–4B–127 Test Results
Broad Band S-S Conducted Interference, 115 VAC,
60 Cycle Return Line (No Filters)

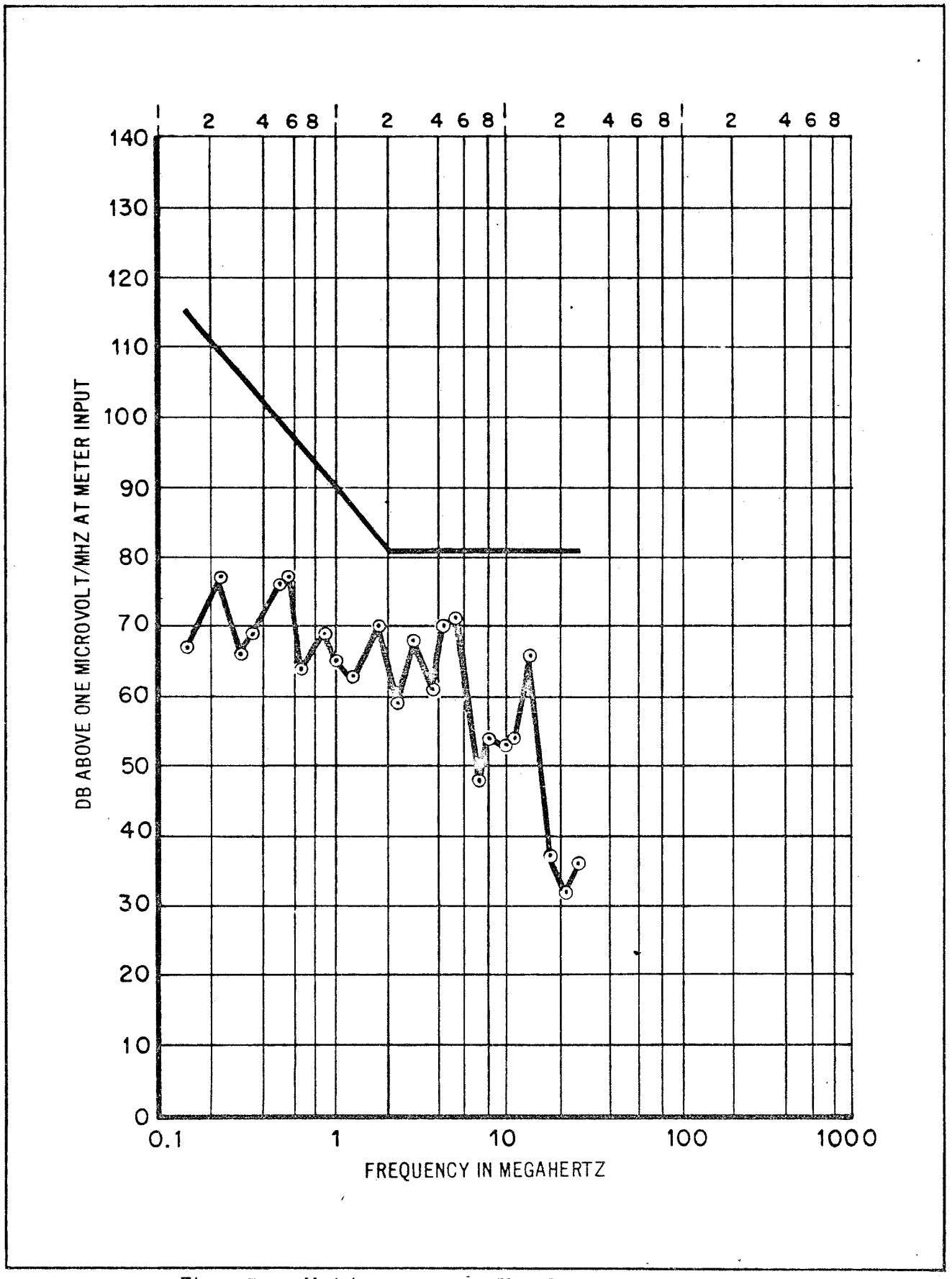

Figure 7–4. Model DSV–4B–127 Test Results
Broad Band S-S Conducted Interference, 115 VAC,
60 Cycle Return Line (With Filters)

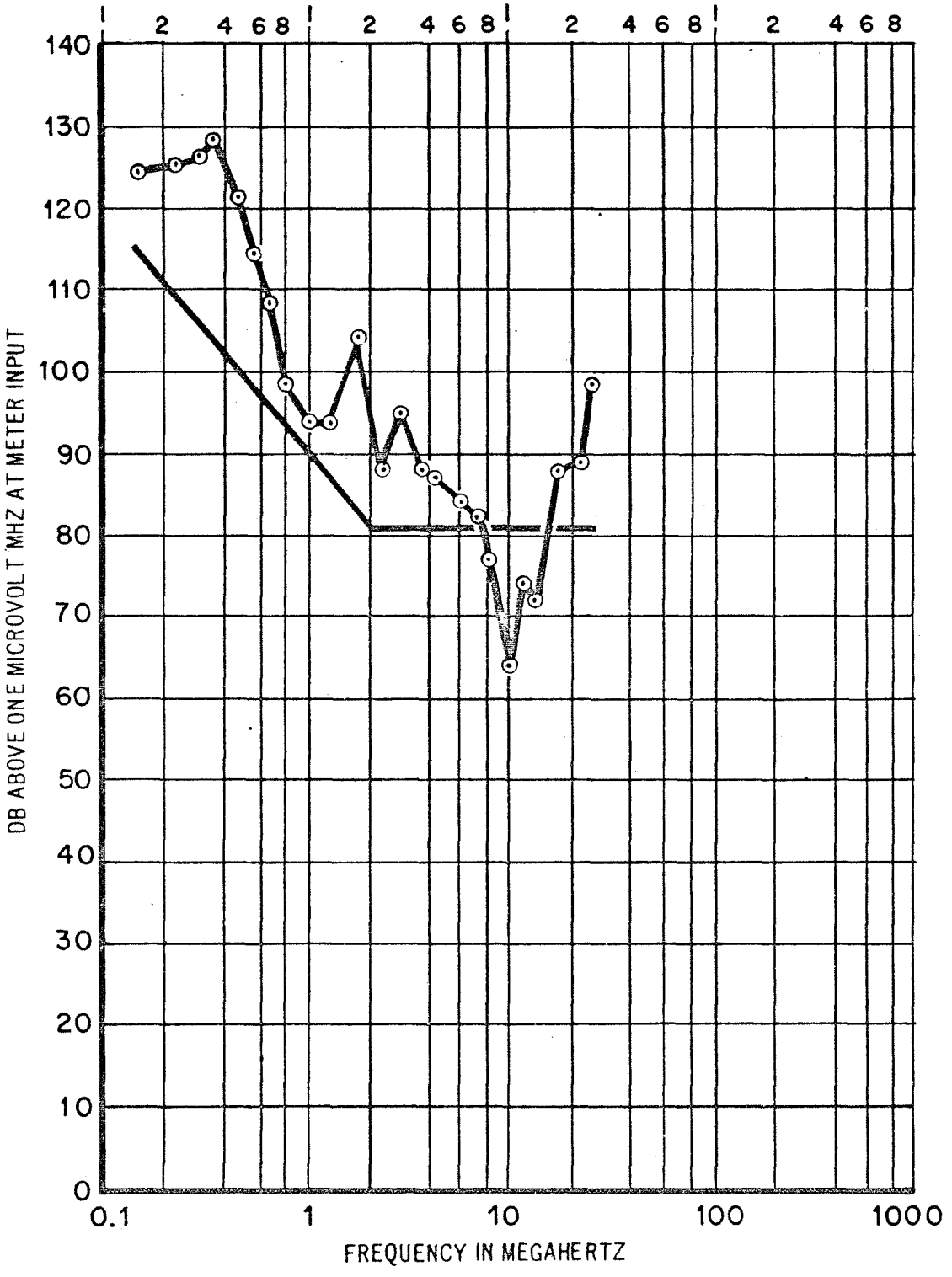

Figure 7–5. Model DSV–4B–127 Test Results
Broad Band S-S Conducted Interference, 115 VAC,
60 Cycle Neutral Line (No Filters)

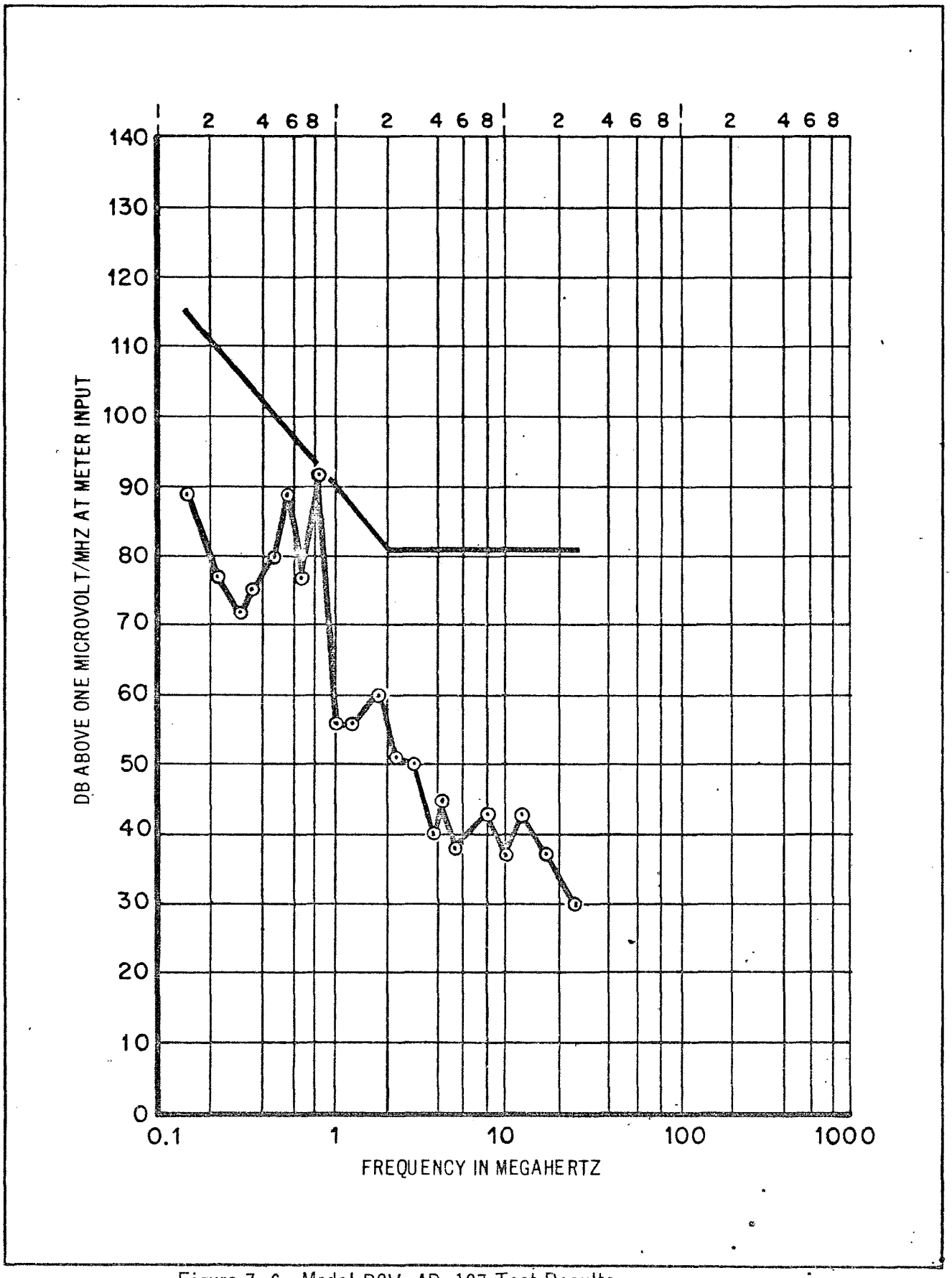

Figure 7–6. Model DSV–4B–127 Test Results
Broad Band S-S Conducted Interference, 115 VAC,
60 Cycle Neutral Line (With Filters)

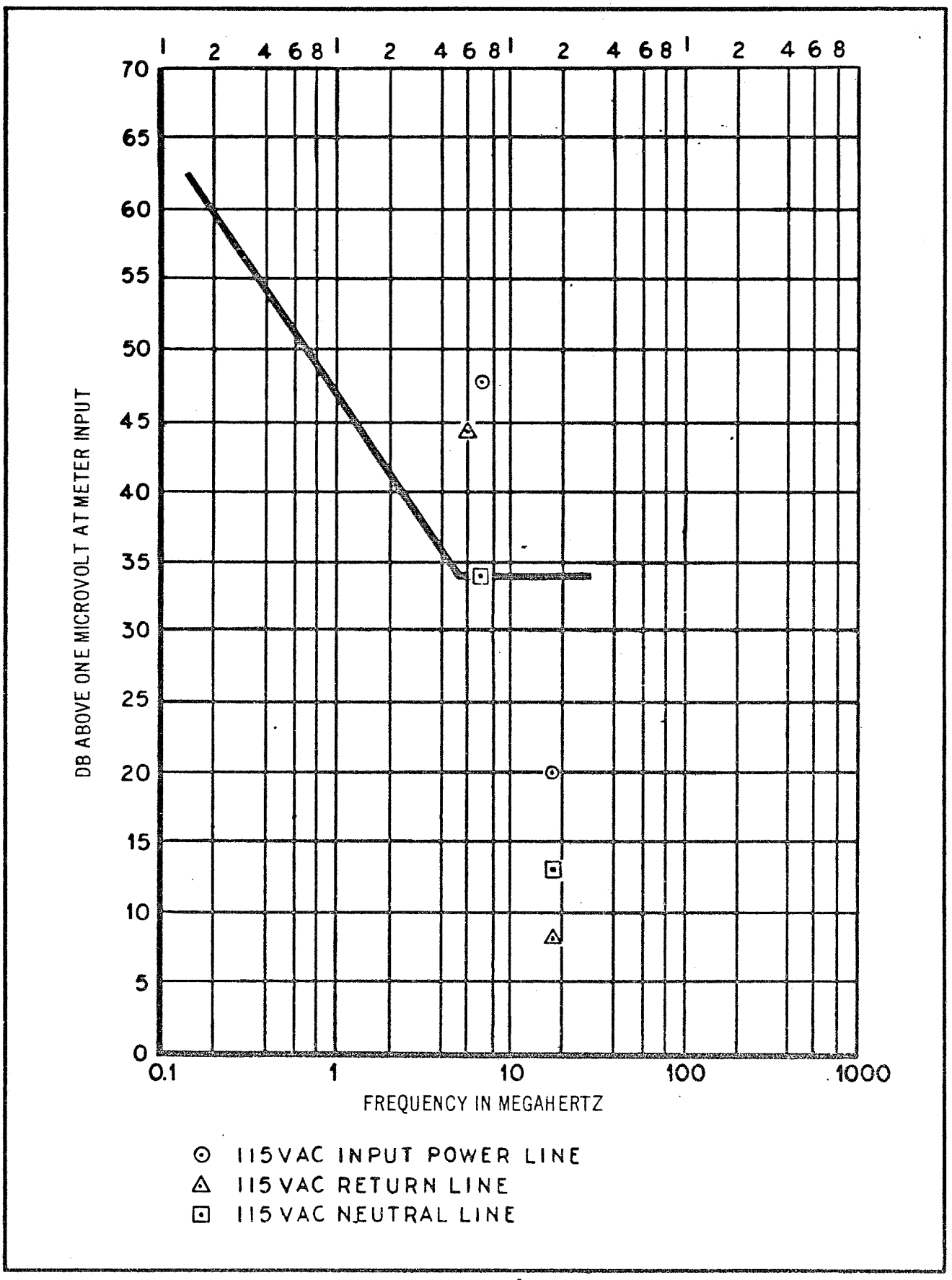

Figure 7–7. Model DSV–4B–127 Test Results
Narrow Band Conducted Interference

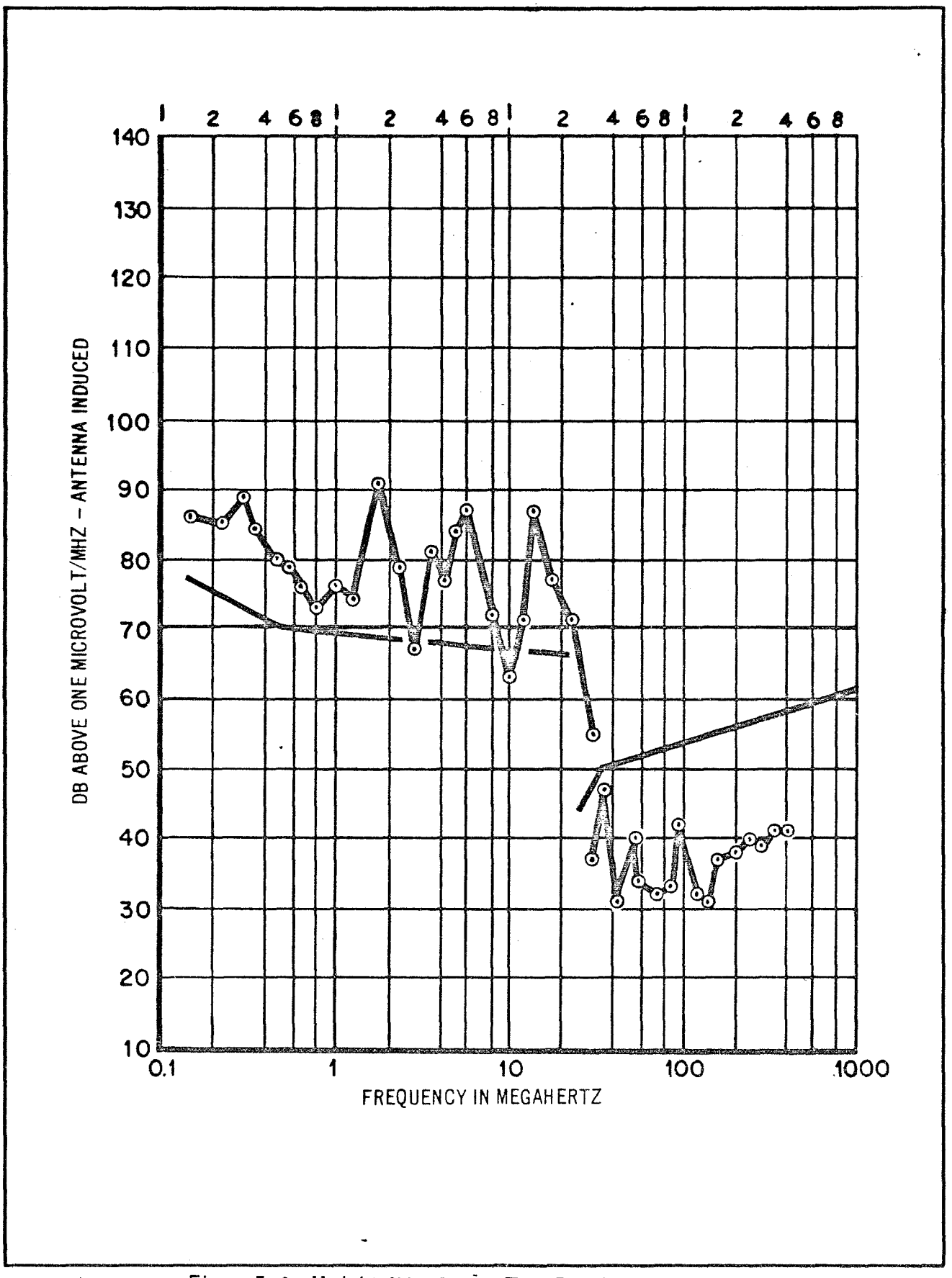

Figure 7–8. Model DSV–4B–127 Test Results
Broad Band S-S Radiated Interference (No Filters)

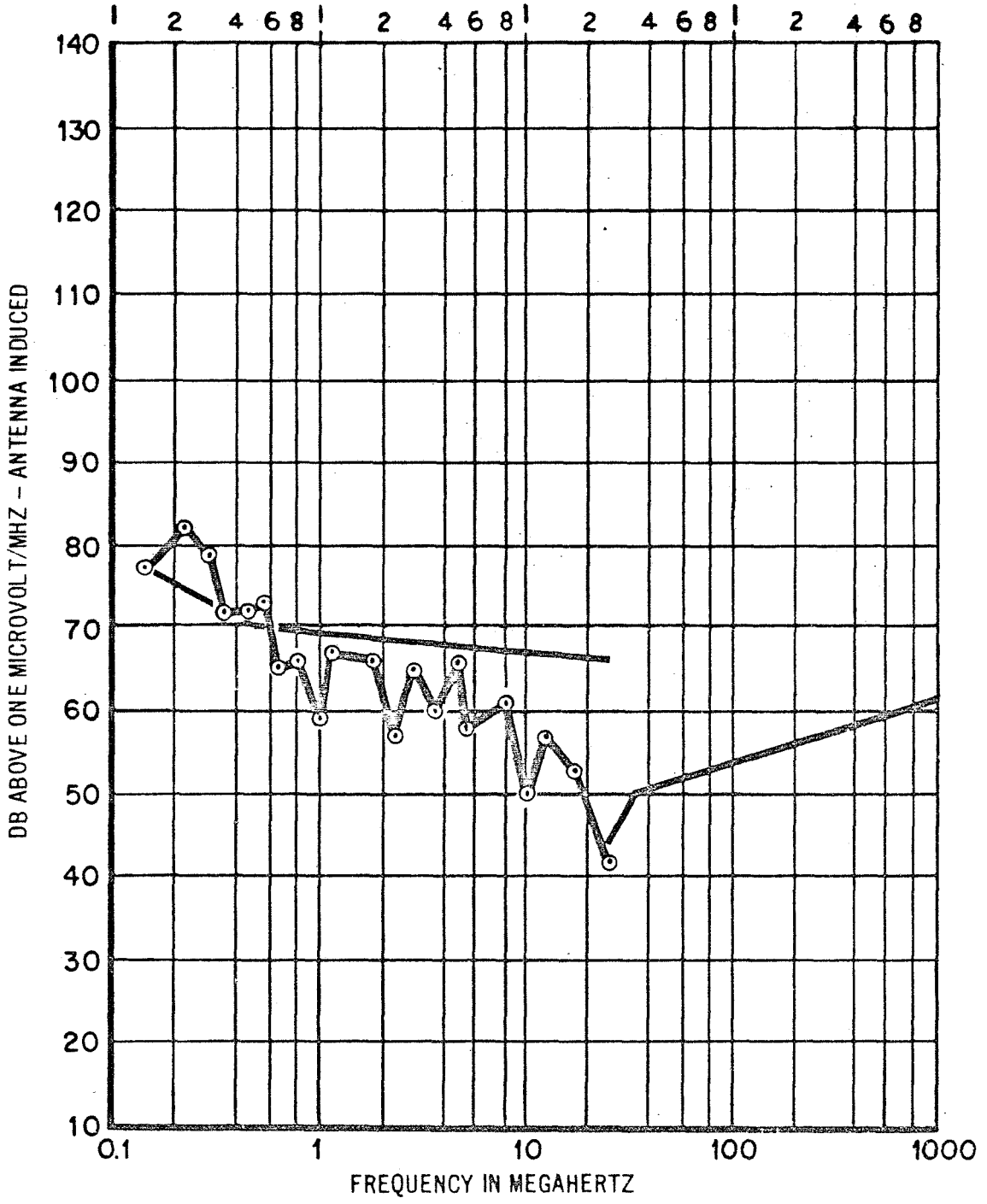

Figure 7–9. Model DSV–4B–127 Test Results
Broad Band S-S Radiated Interference (With Filters)

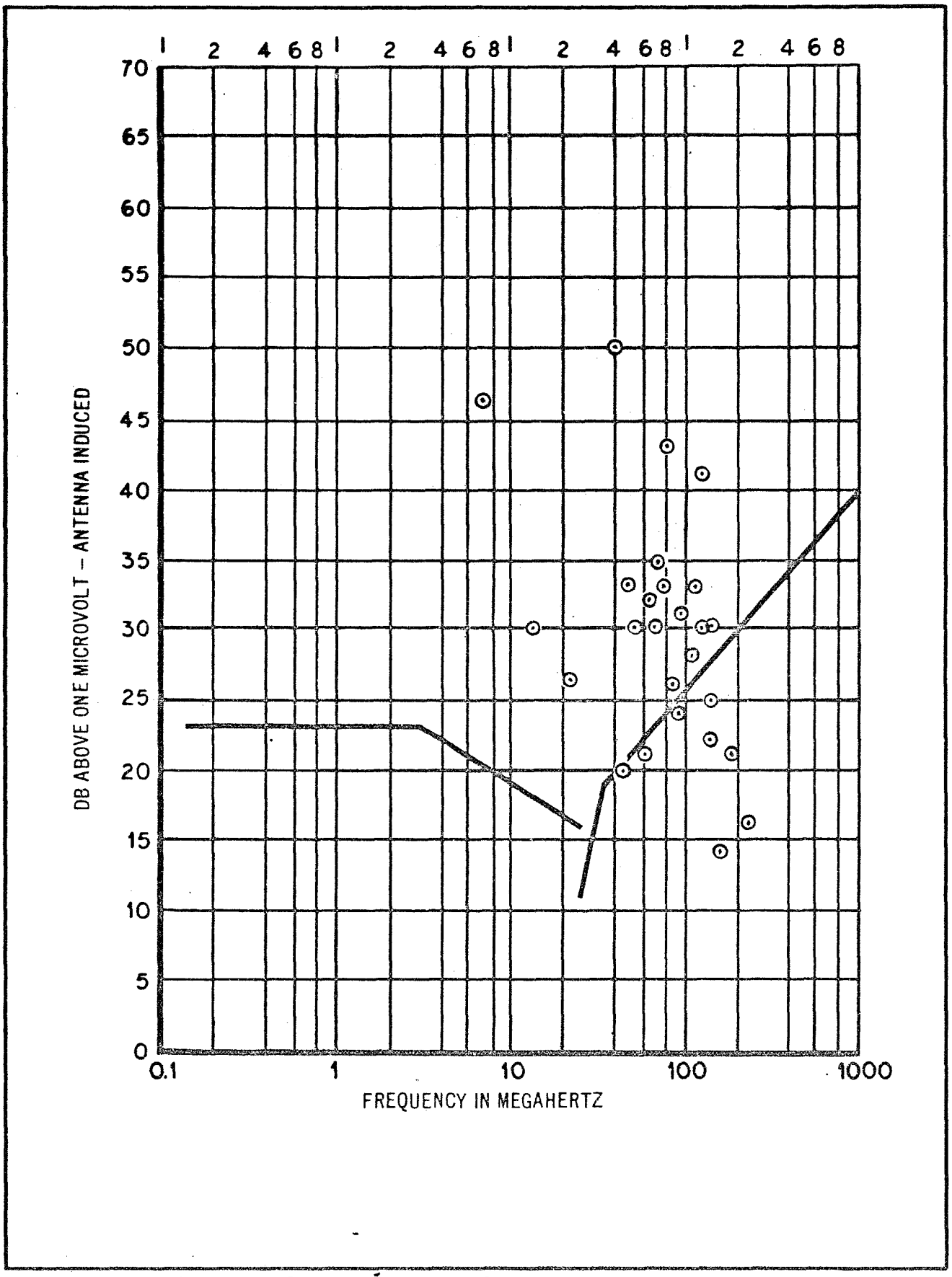

Figure 7–10. Model DSV–4B–127 Test Results
Narrow Band Radiated Interference (No Filters)

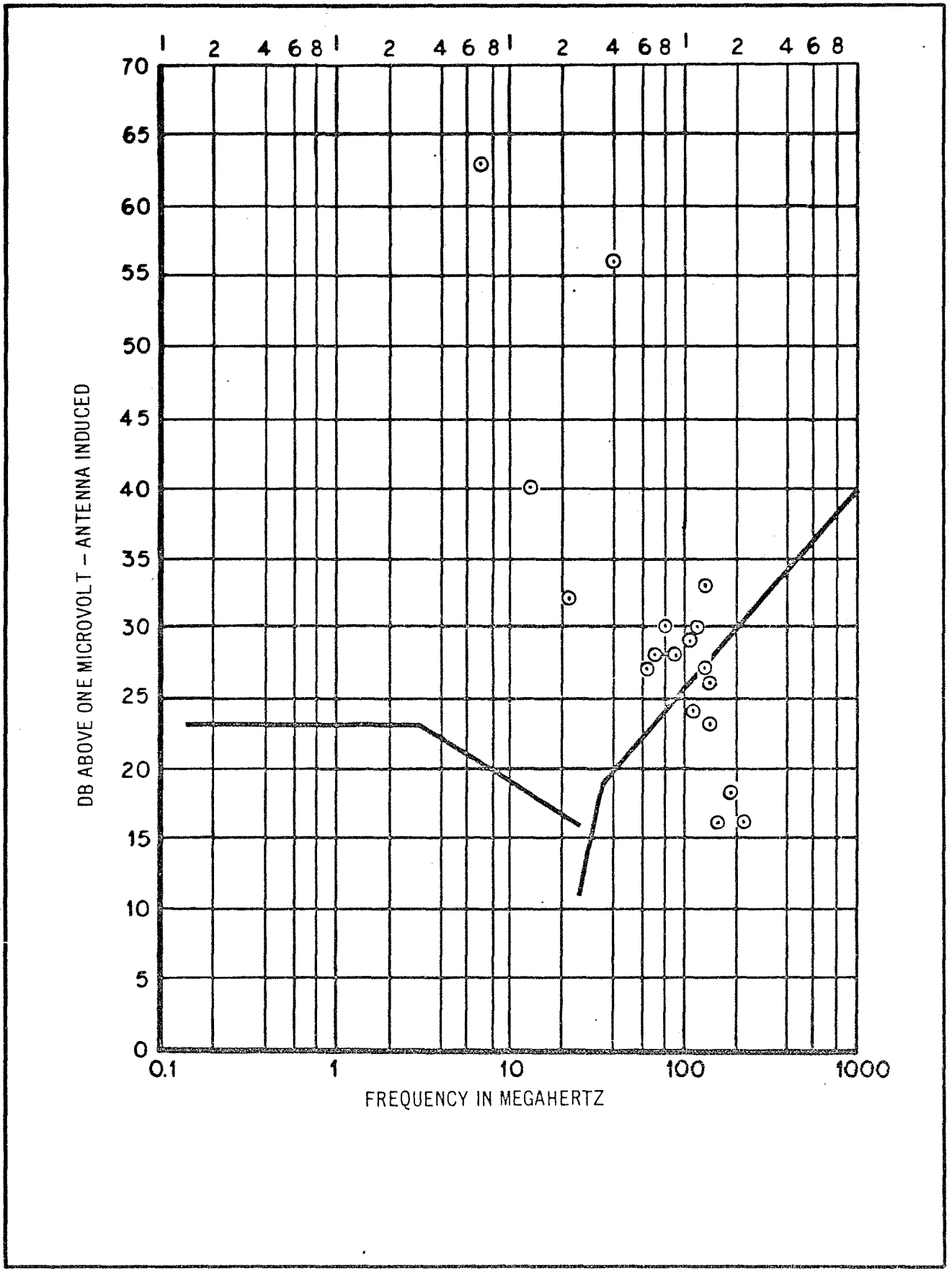

Figure 7–11. Model DSV–4B–127 Test Results
Narrow Band Radiated Interference (With Filters)

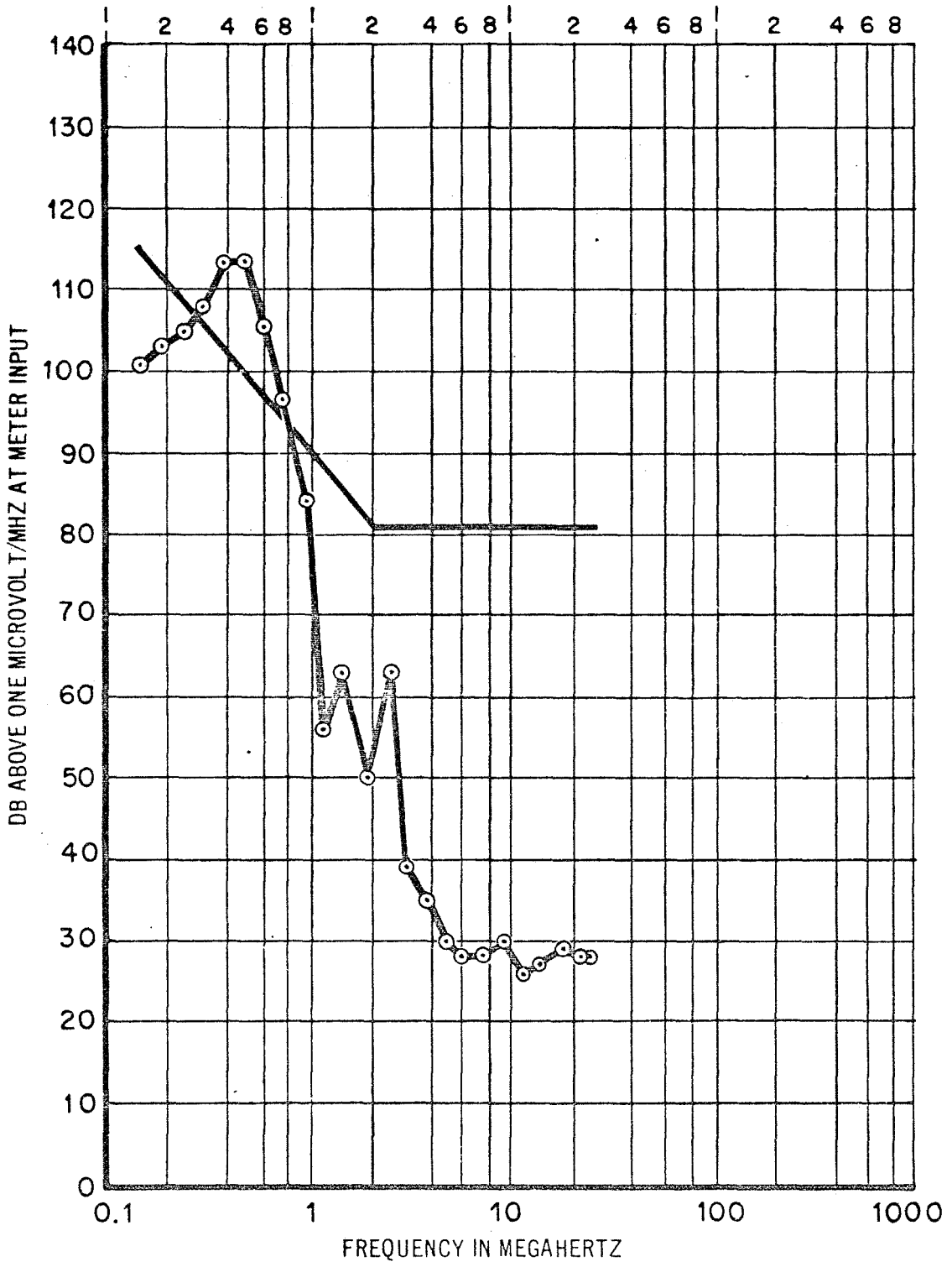

Figure 8–1. Model DSV–4B–128 Test Results
Broad Band S-S Conducted Interference, 115 VAC,
60 Cycle Input Power Line

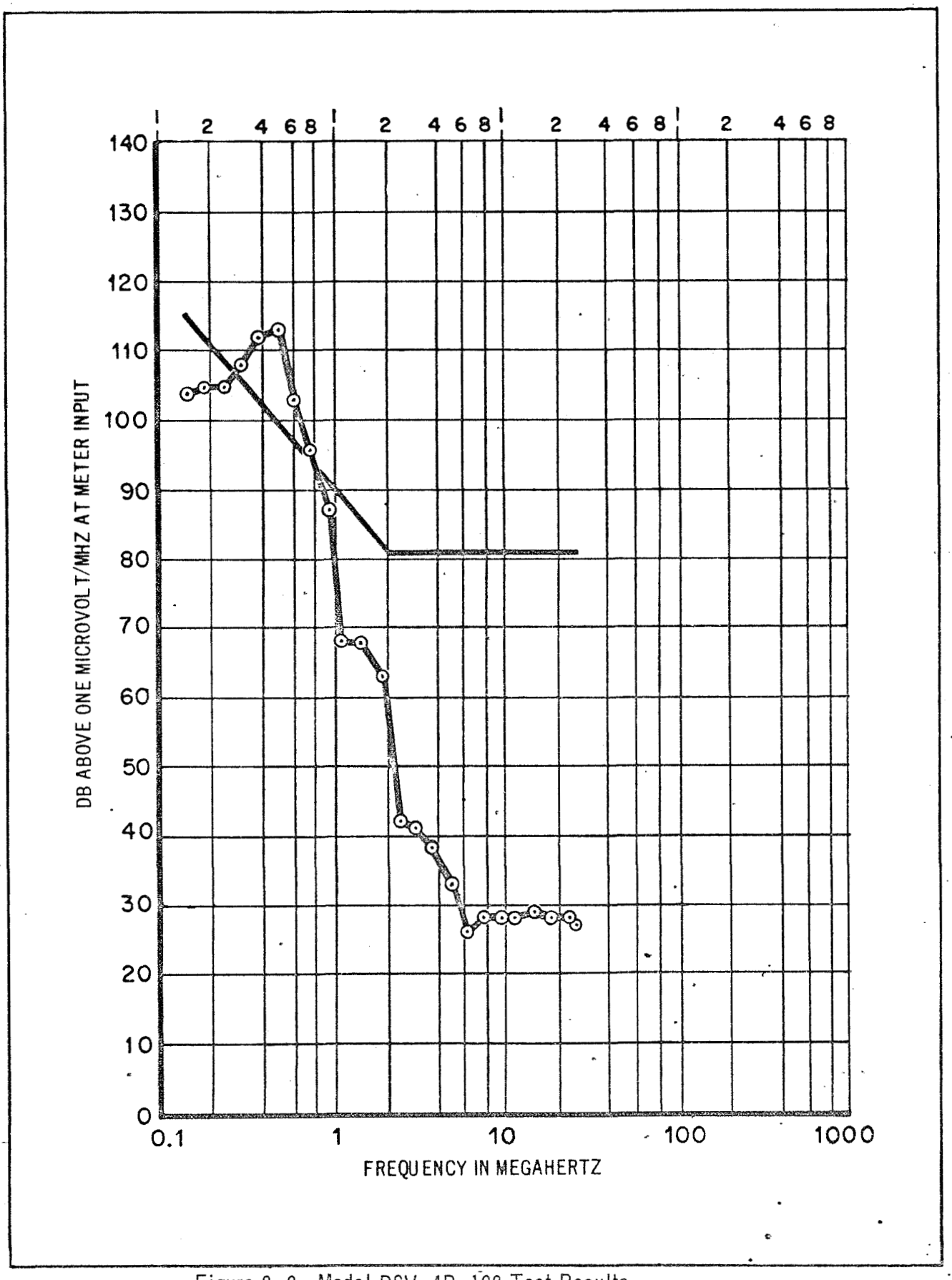

Figure 8–2. Model DSV–4B–128 Test Results
Broad Band S-S Conducted Interference, 115 VAC,
60 Cycle Return Line

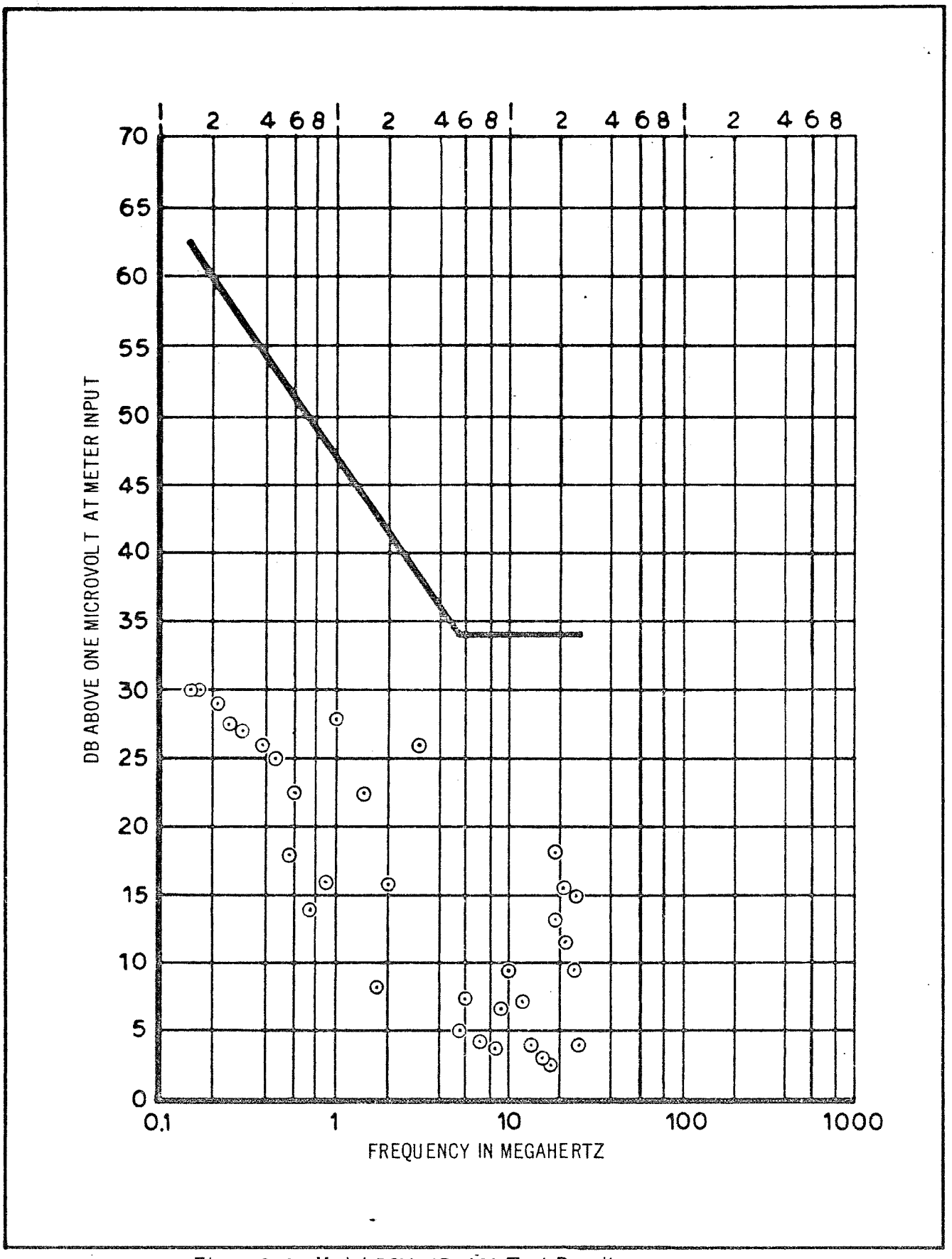

Figure 8–3. Model DSV–4B–128 Test Results
Narrow Band Conducted Interference, 115 VAC, 60
Cycle Input Power Line

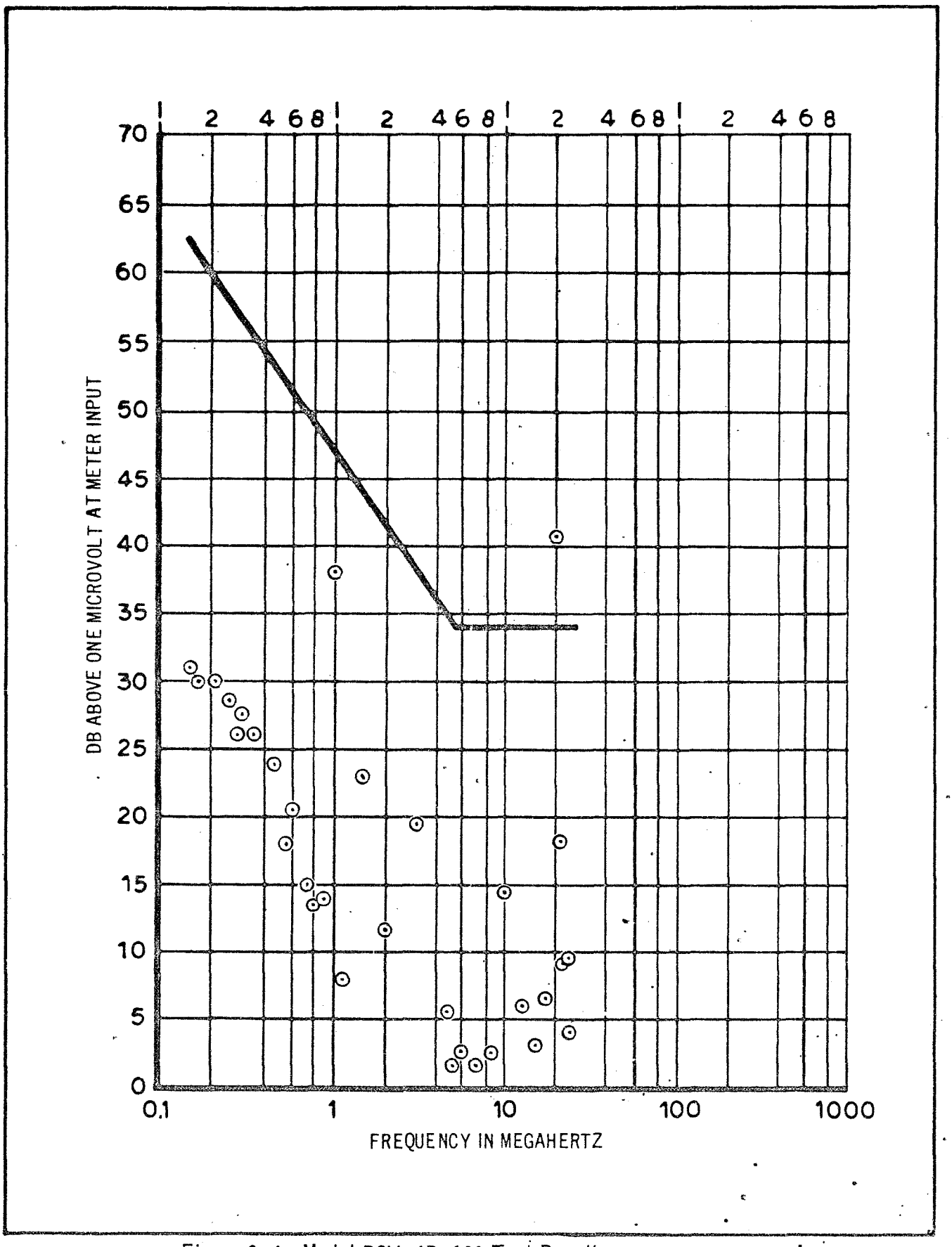

Figure 8–4. Model DSV–4B–128 Test Results
Narrow Band Conducted Interference, 115 VAC, 60 Cycle Return Line.

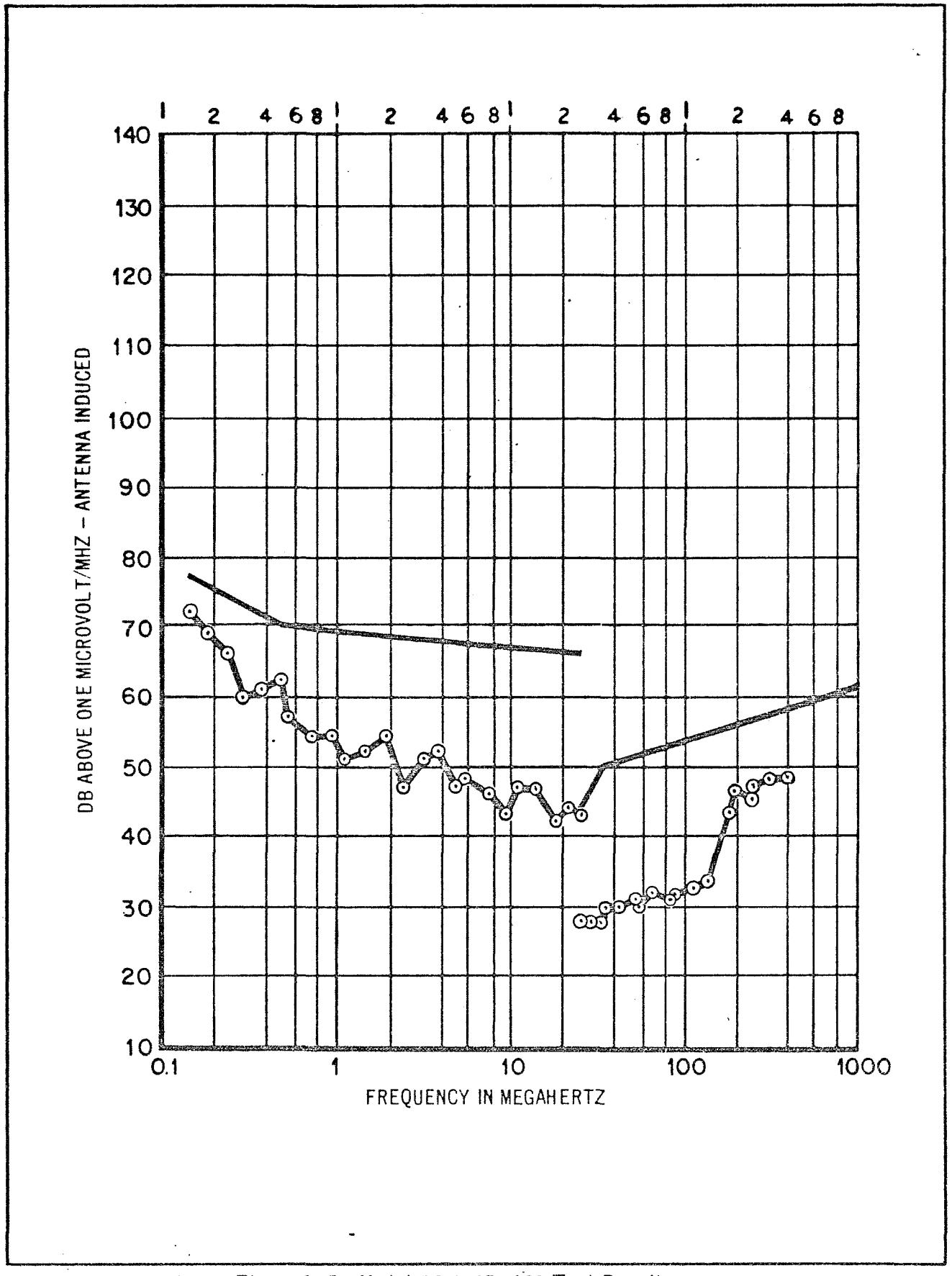

Figure 8–5. Model DSV–4B–128 Test Results
Broad Band S-S Radiated Interference.

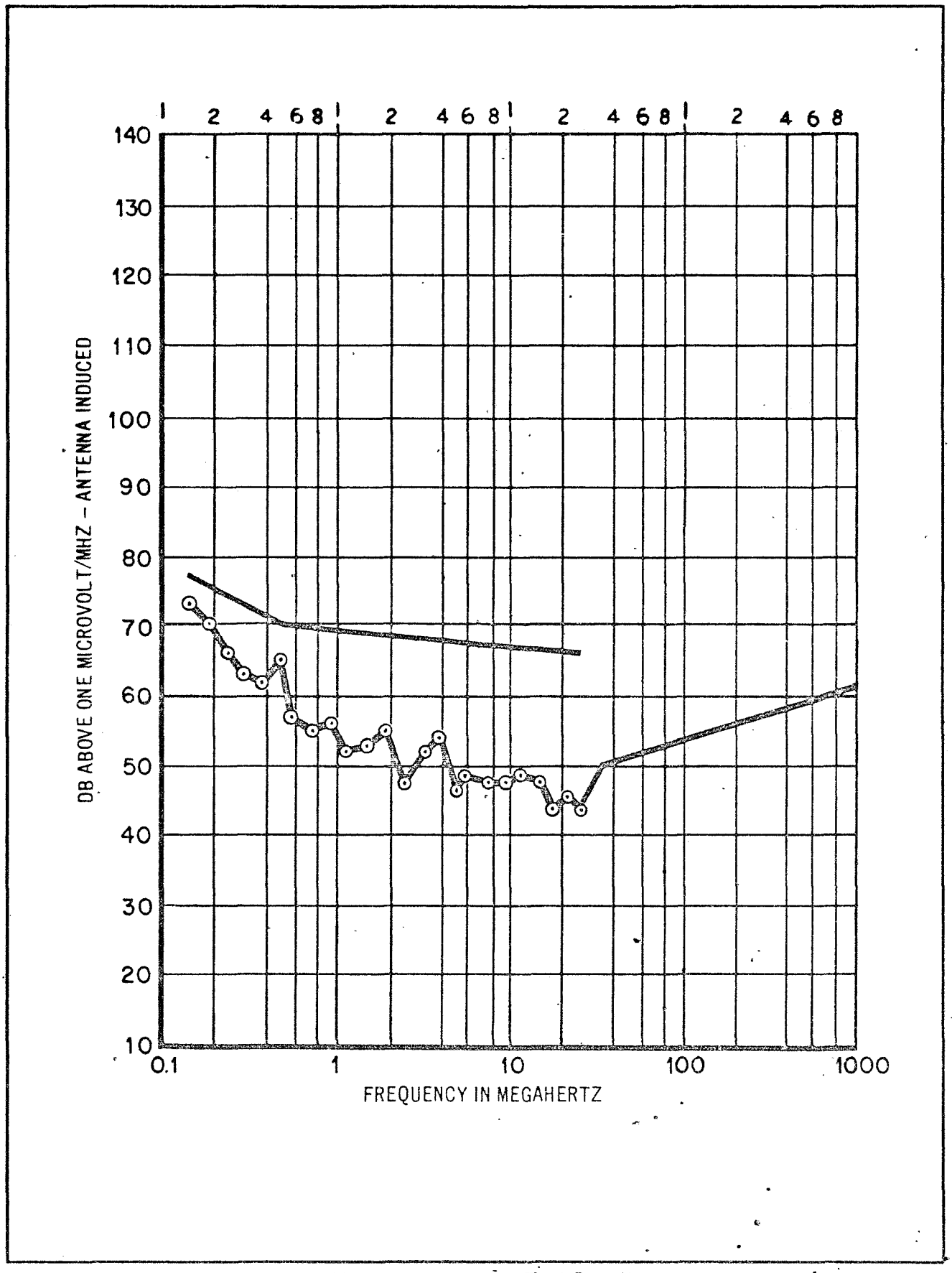

Figure 8–6. Model DSV–4B–128 Test Results
Broad Band Radiated Transient Interference

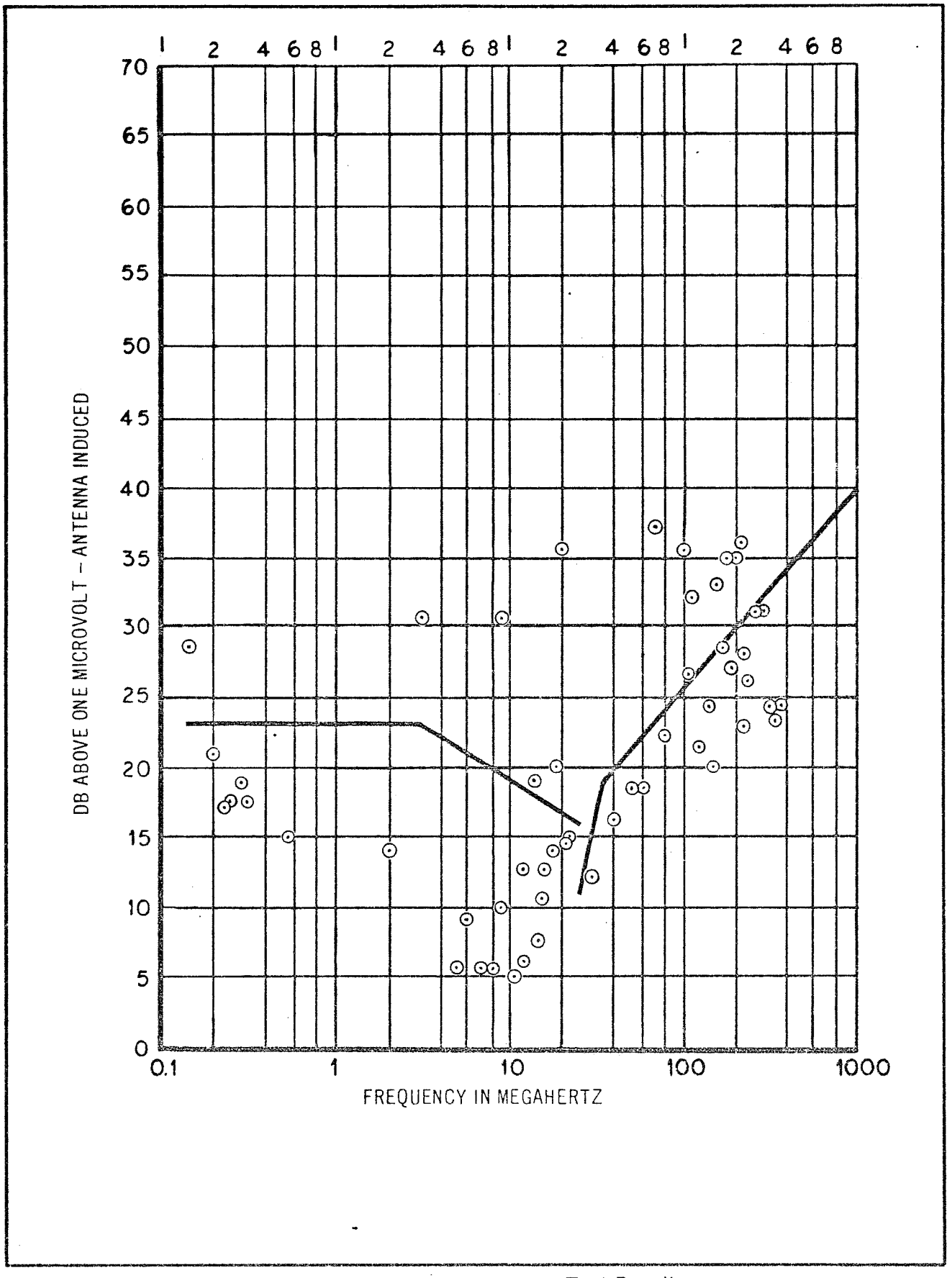

Figure 8–7. Model DSV–4B–128 Test Results
Narrow Band Radiated Interference

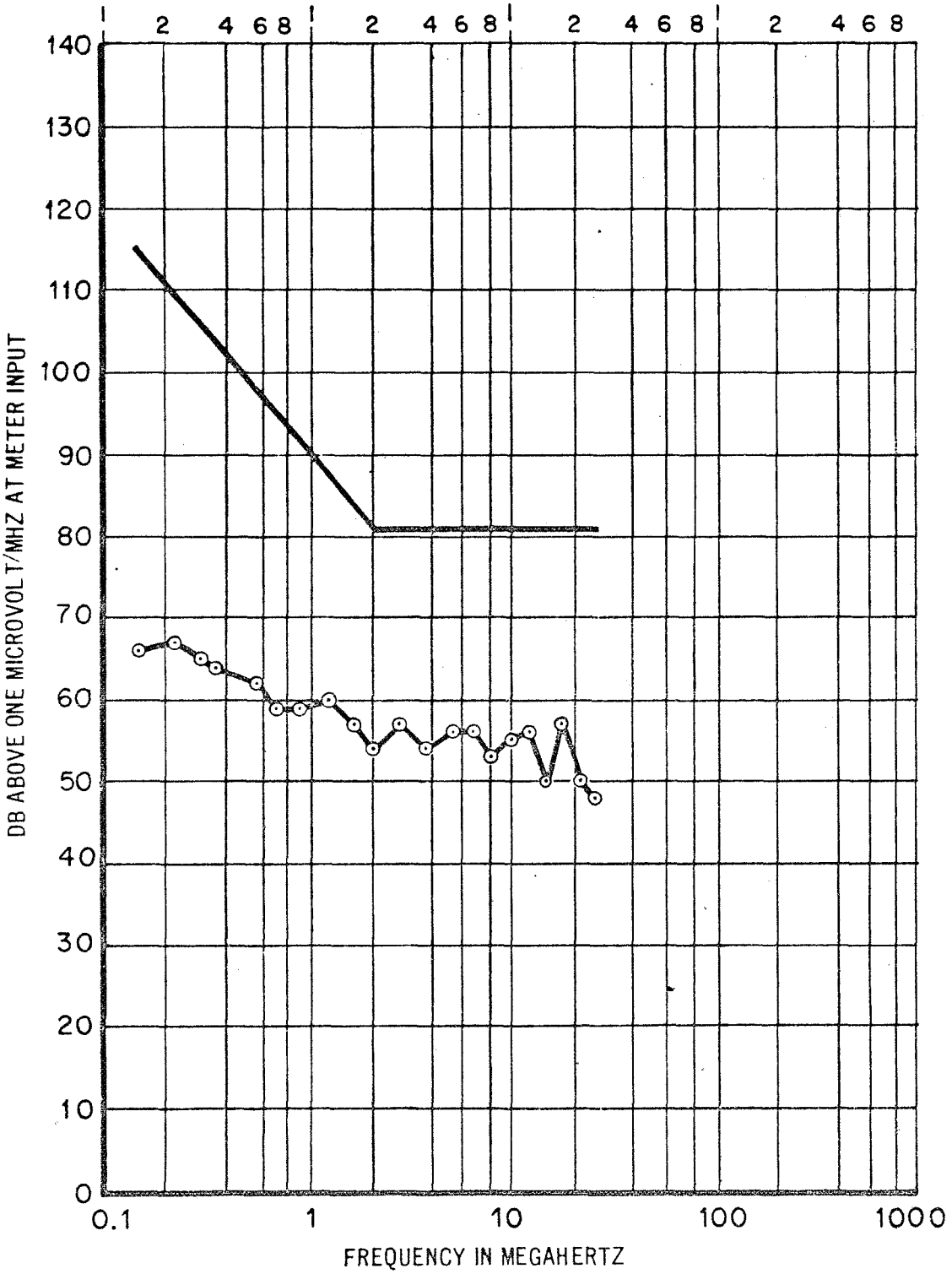

Figure 9-1. Model DSV-4B-136 Test Results
Broad Band Conducted Interference, 115 VAC Input Line

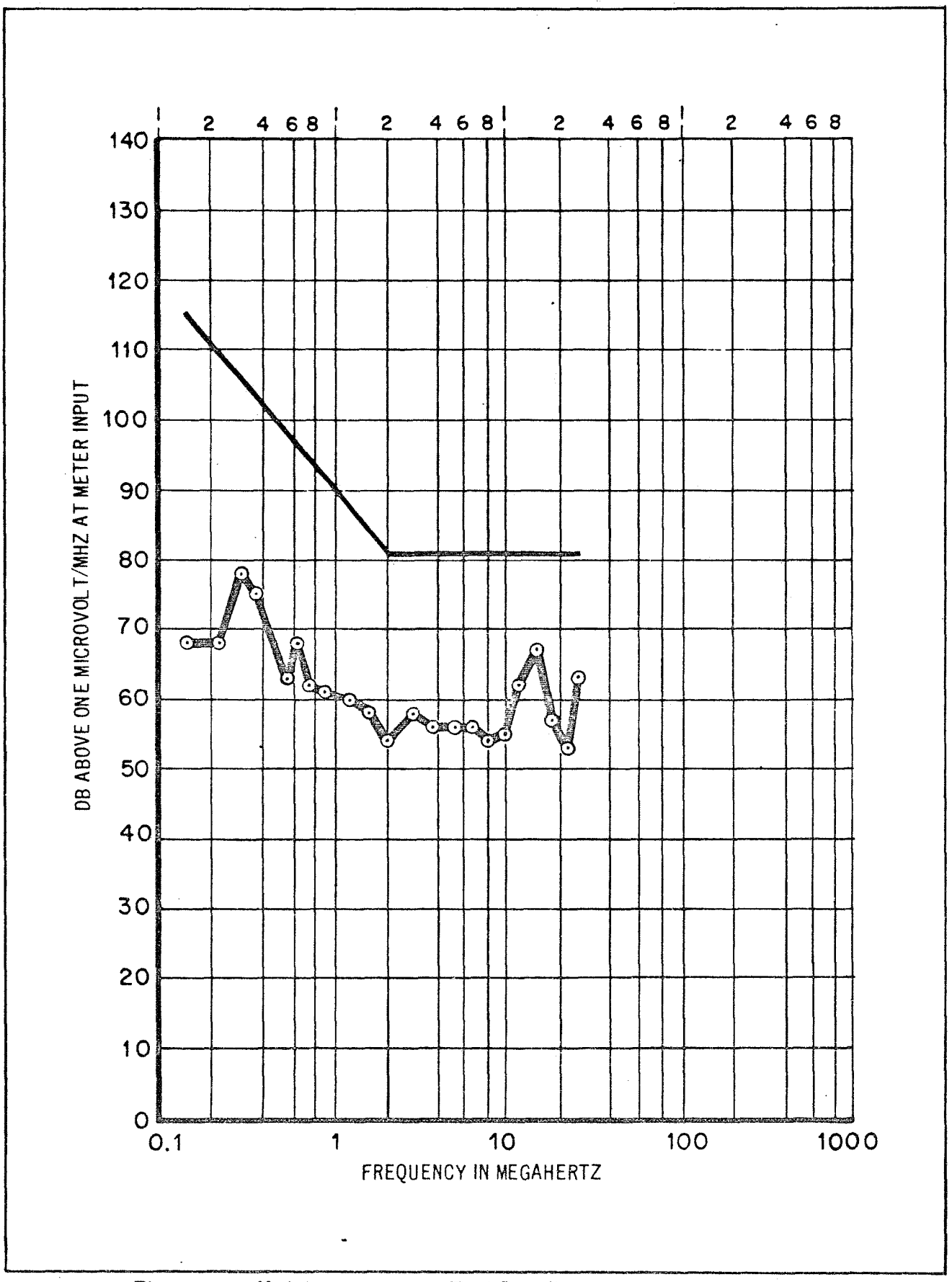

Figure 9–2. Model DSV–4B–136 Test Results
Broad Band Conducted Interference, 115 VAC Return Line

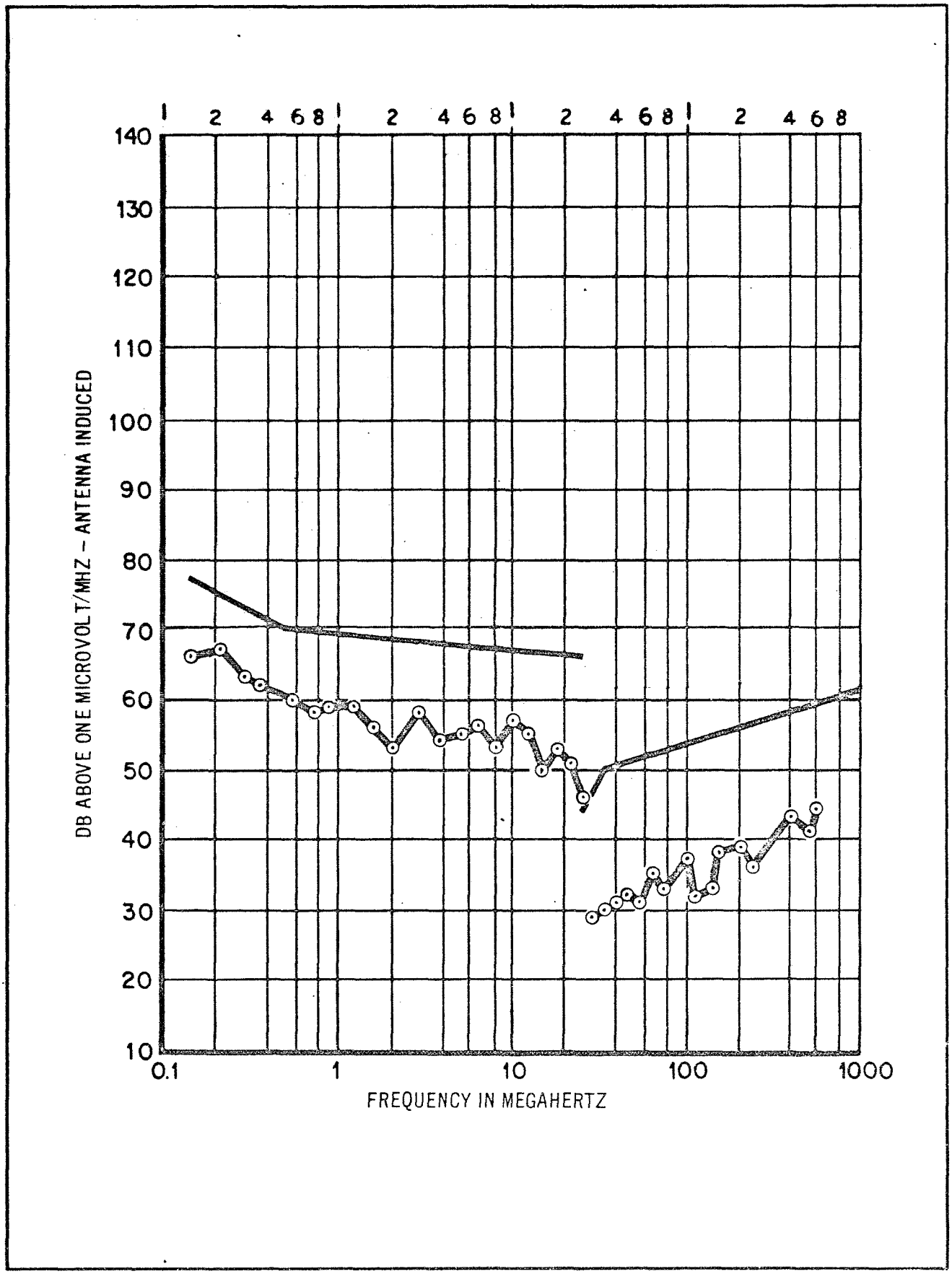

Figure 9–3. Model DSV–4B–136 Test Results
Broad Band Radiated Interference

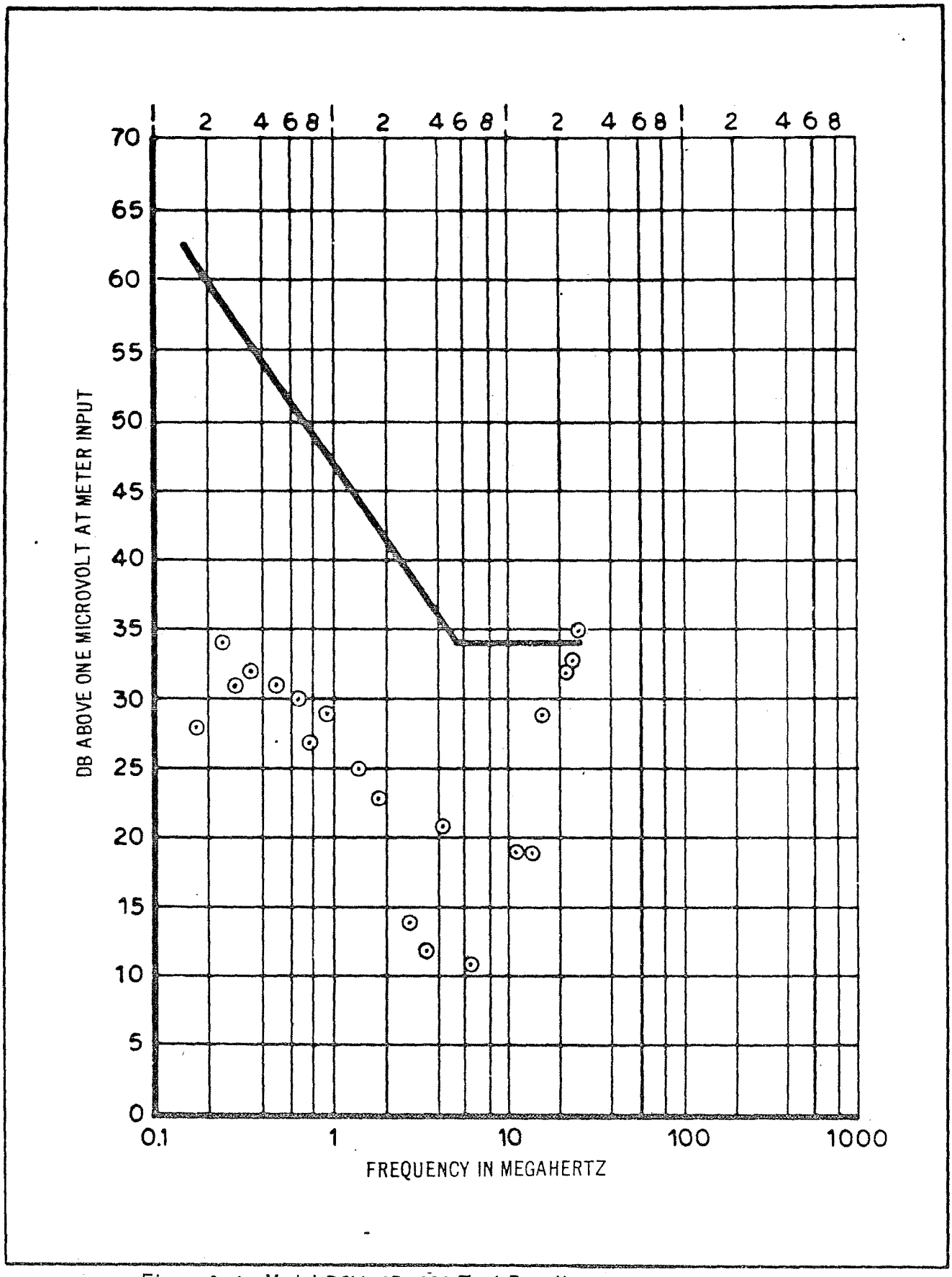

Figure 9–4. Model DSV–4B–136 Test Results
Narrow Band Conducted Interference; 115 VAC Return Line

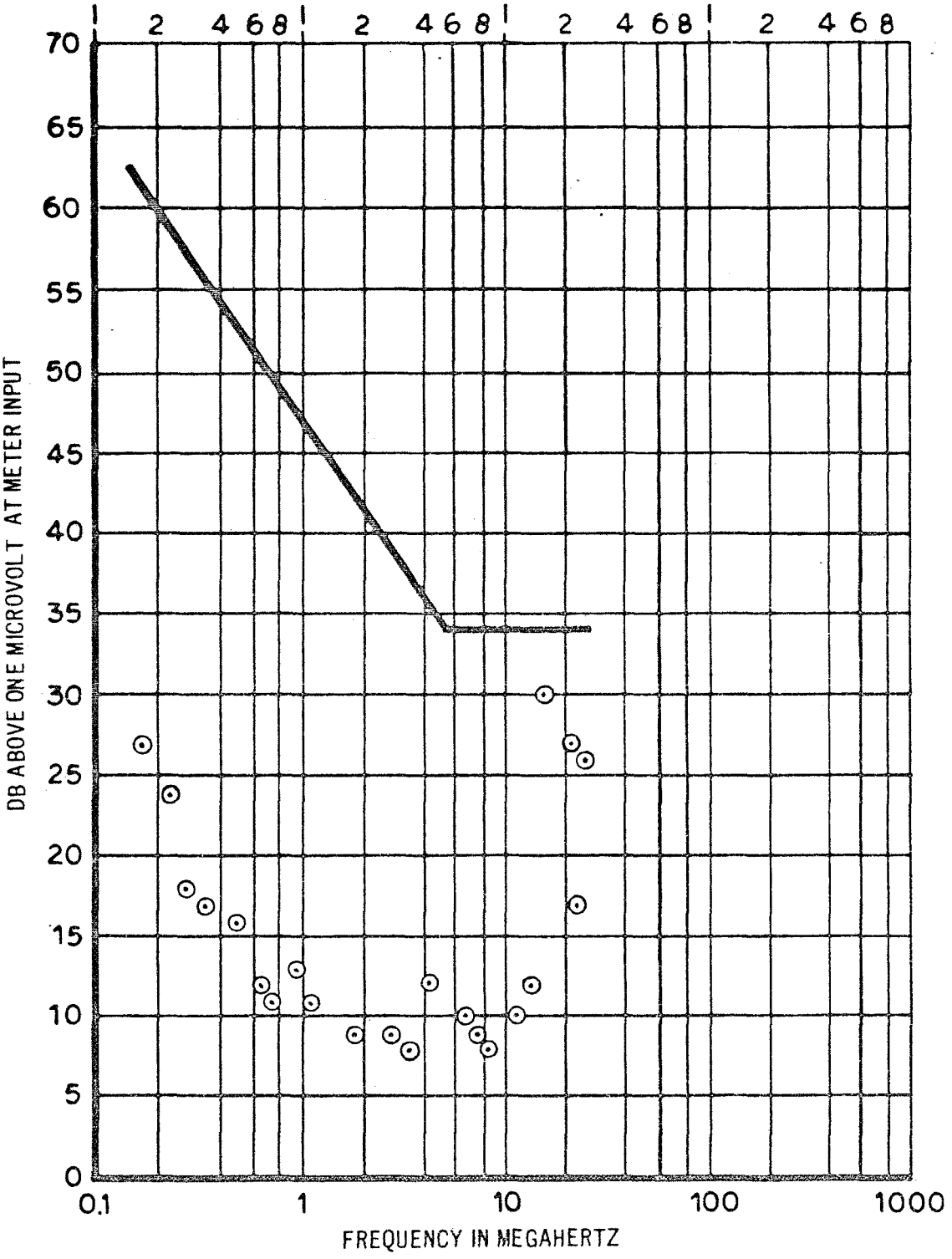

Figure 9–5. Model DSV–4B–136 Test Results
Narrow Band Conducted Interference, 115 VAC Input Line

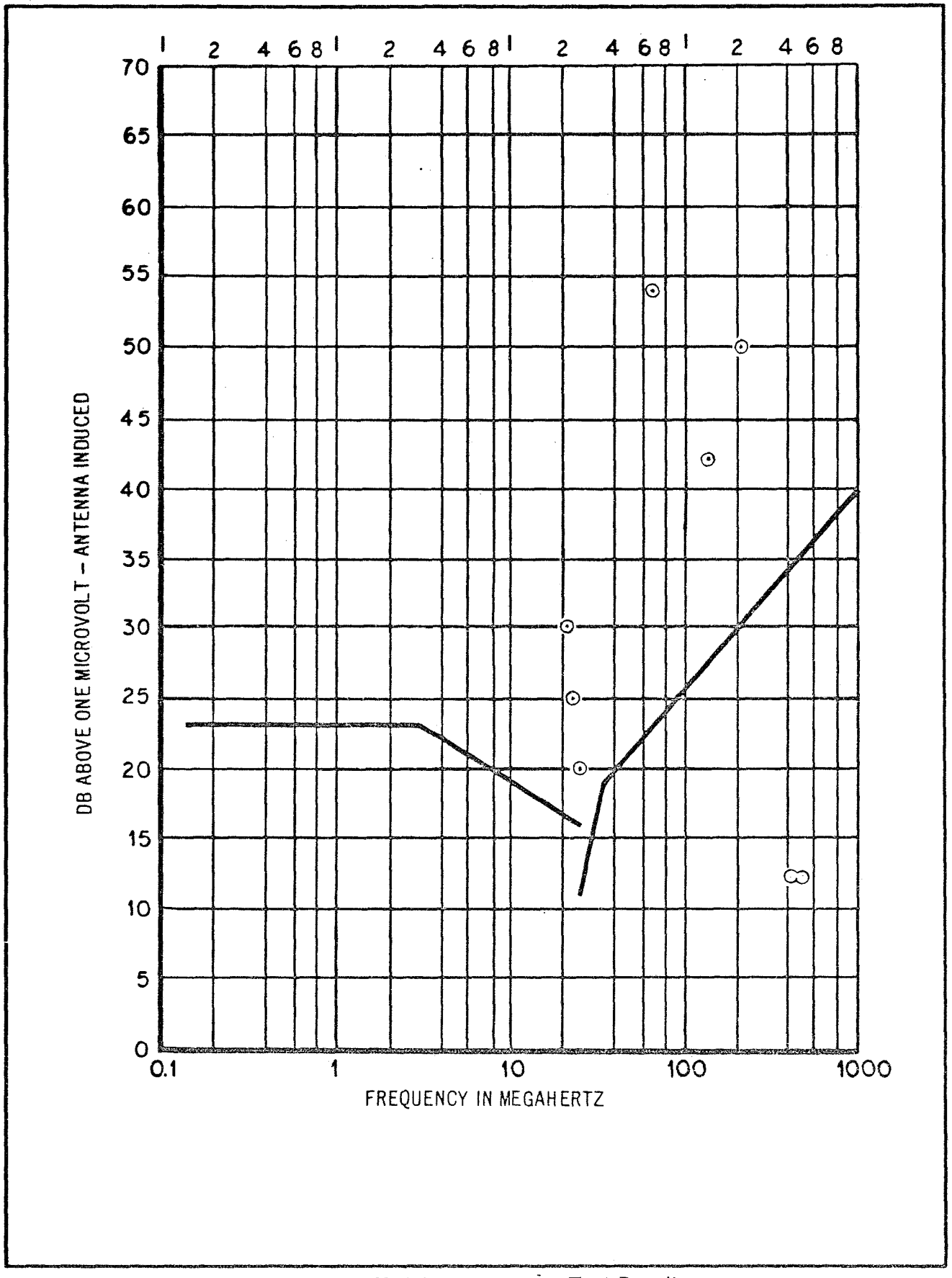

Figure 9–6. Model DSV–4B–136 Test Results
Narrow Band Radiated Interference

APPENDIX 10

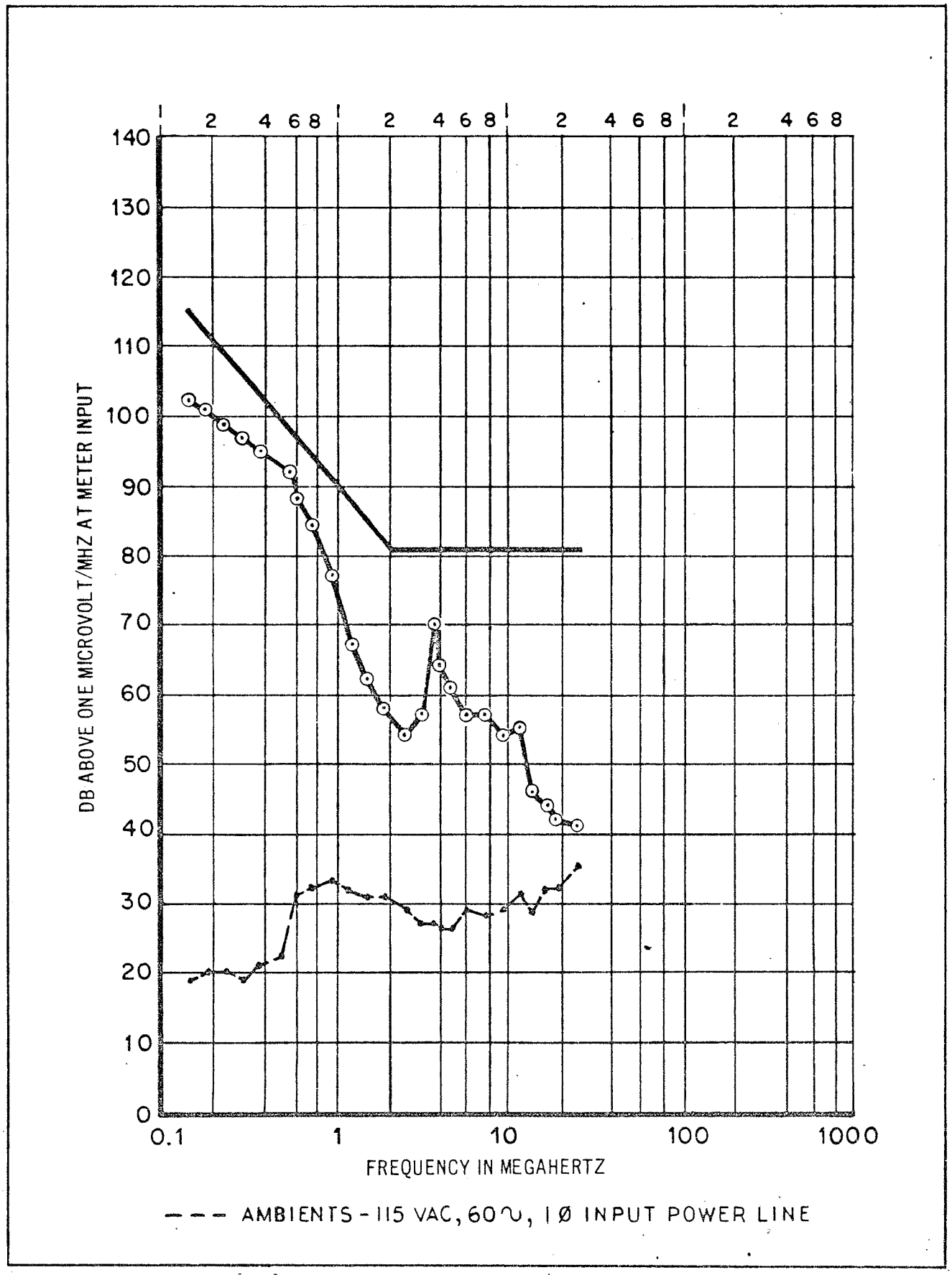

Figure 10–1. Model DSV–4B–296 Test Results
Broad Band Conducted Interference, 115 VAC,
60 Cycle Input Line (Monitoring Equipment "OFF")

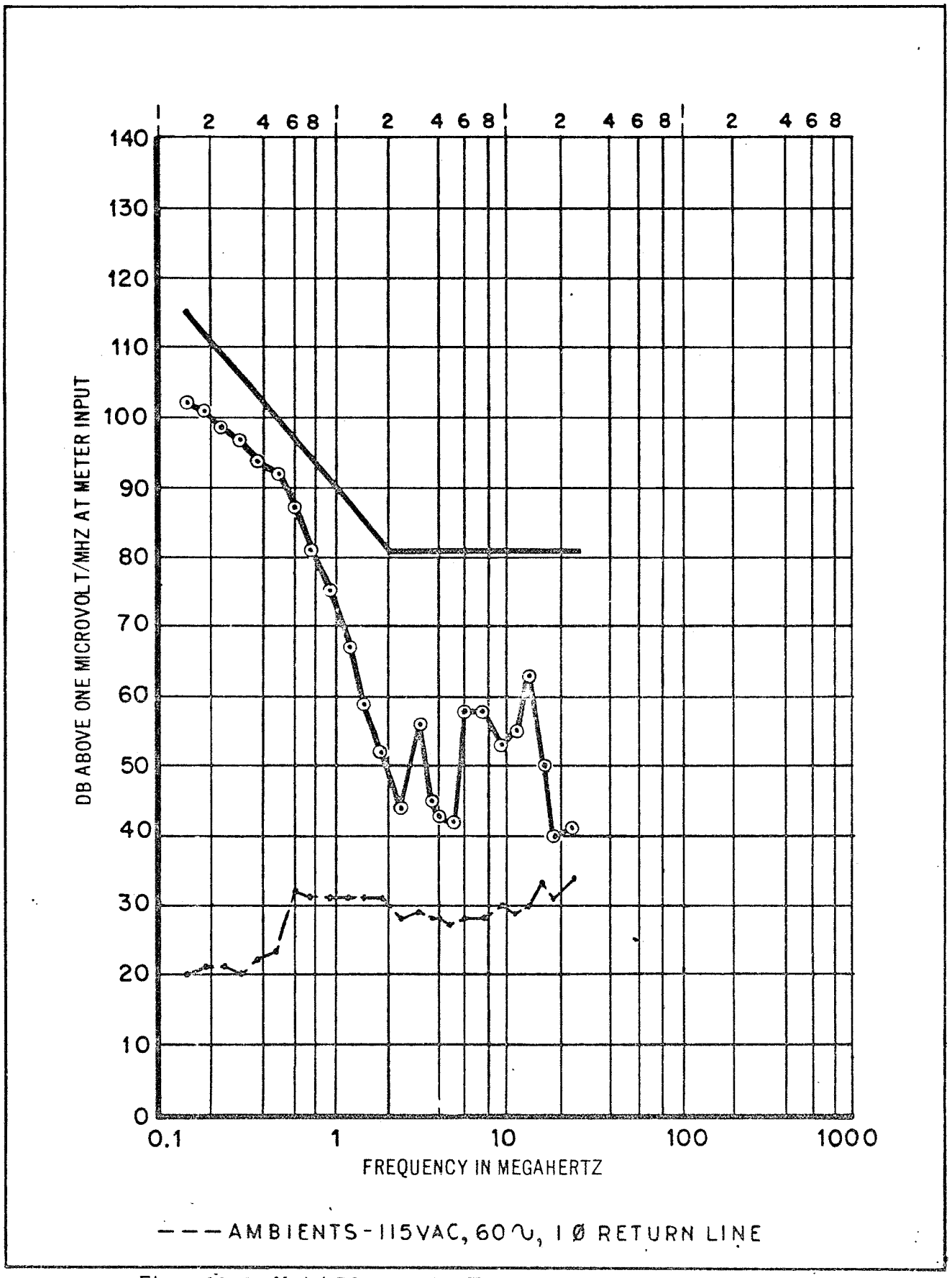

Figure 10–2. Model DSV–4B–296 Test Results
Broad Band Conducted Interference, 115 VAC, 60 Cycle
Return Line (Monitoring Equipment "OFF")

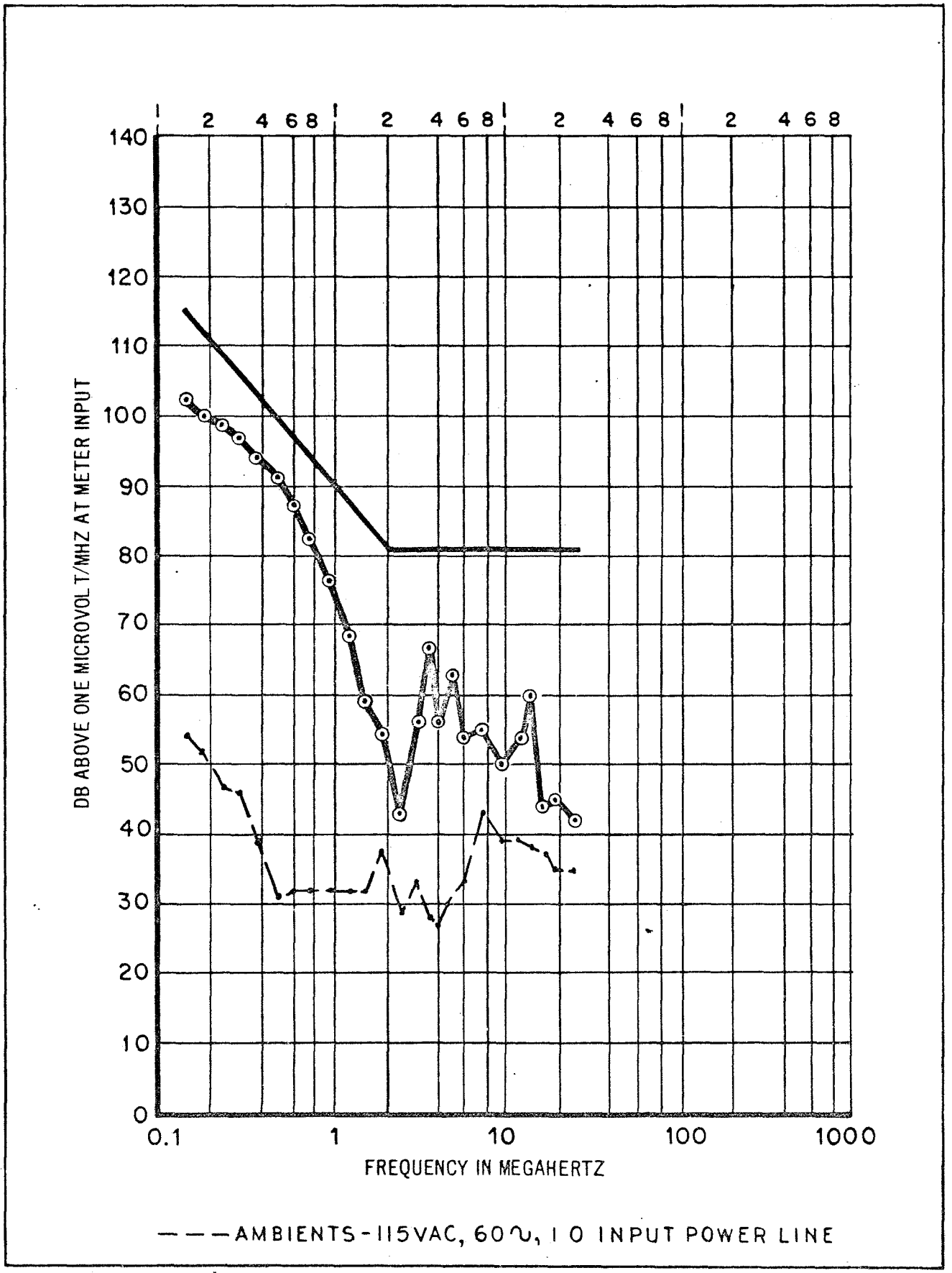

Figure 10–3. Model DSV–4B–296 Test Results
Broad Band Conducted Interference, 115 VAC, 60 Cycle
Input Line (Monitoring Equipment "ON")

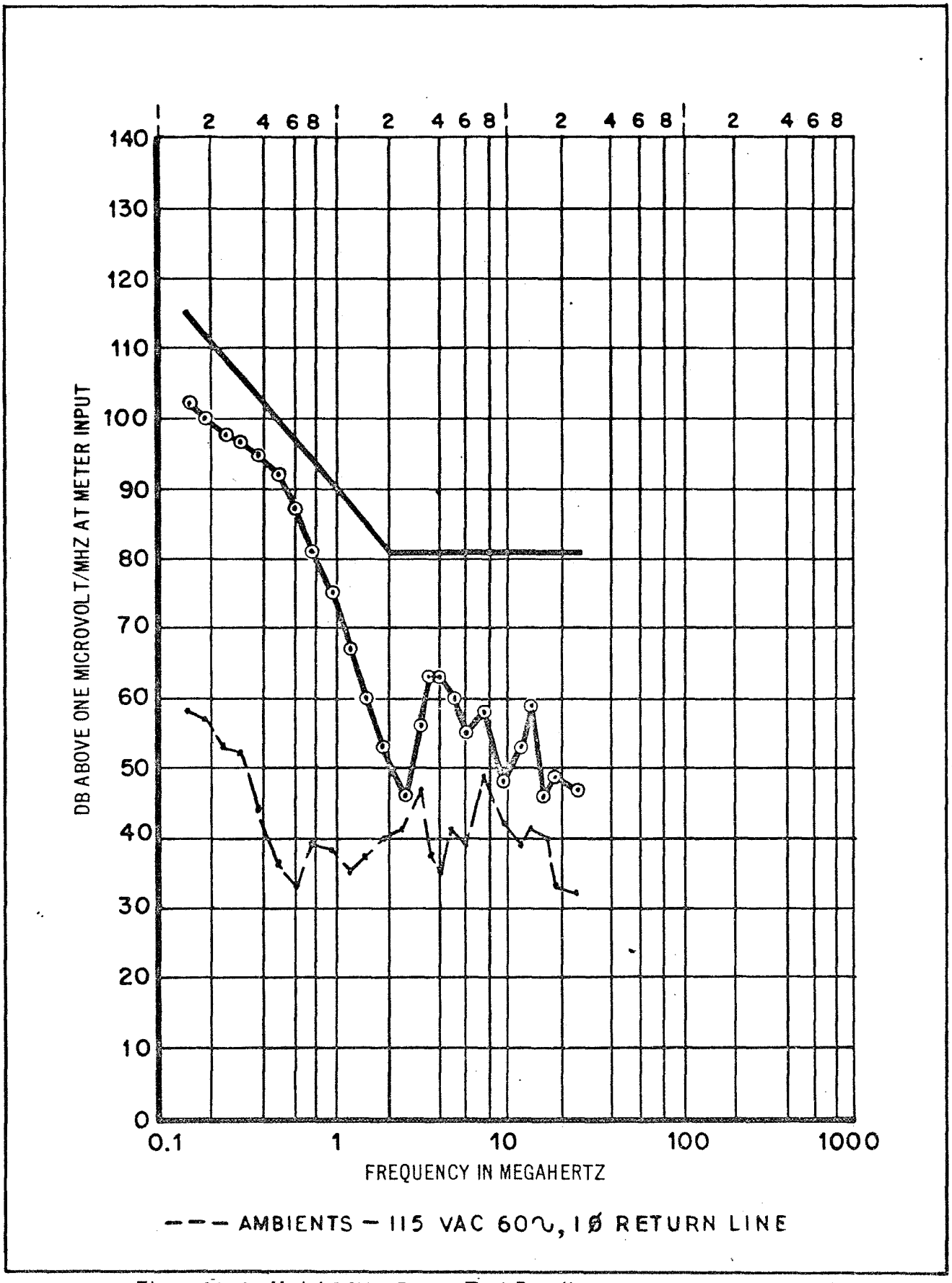

Figure 10–4. Model DSV–4B–296 Test Results
Broad Band Conducted Interference, 115 VAC, 60 Cycle
Return Line (Monitoring Equipment "ON")

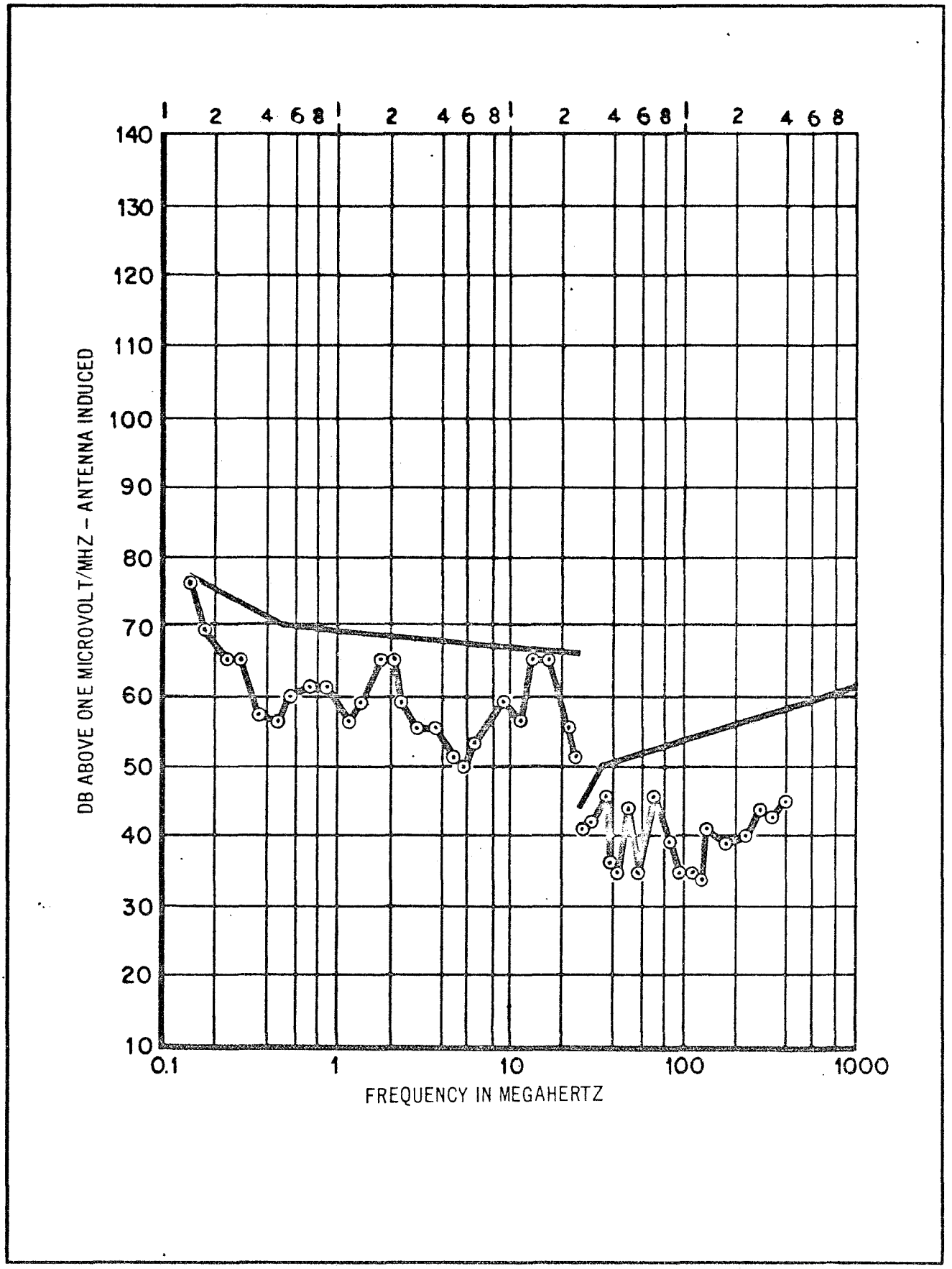

Figure 10–5. Model DSV–4B–296 Test Results
Broad Band Radiated Interference (Monitoring Equipment "ON")

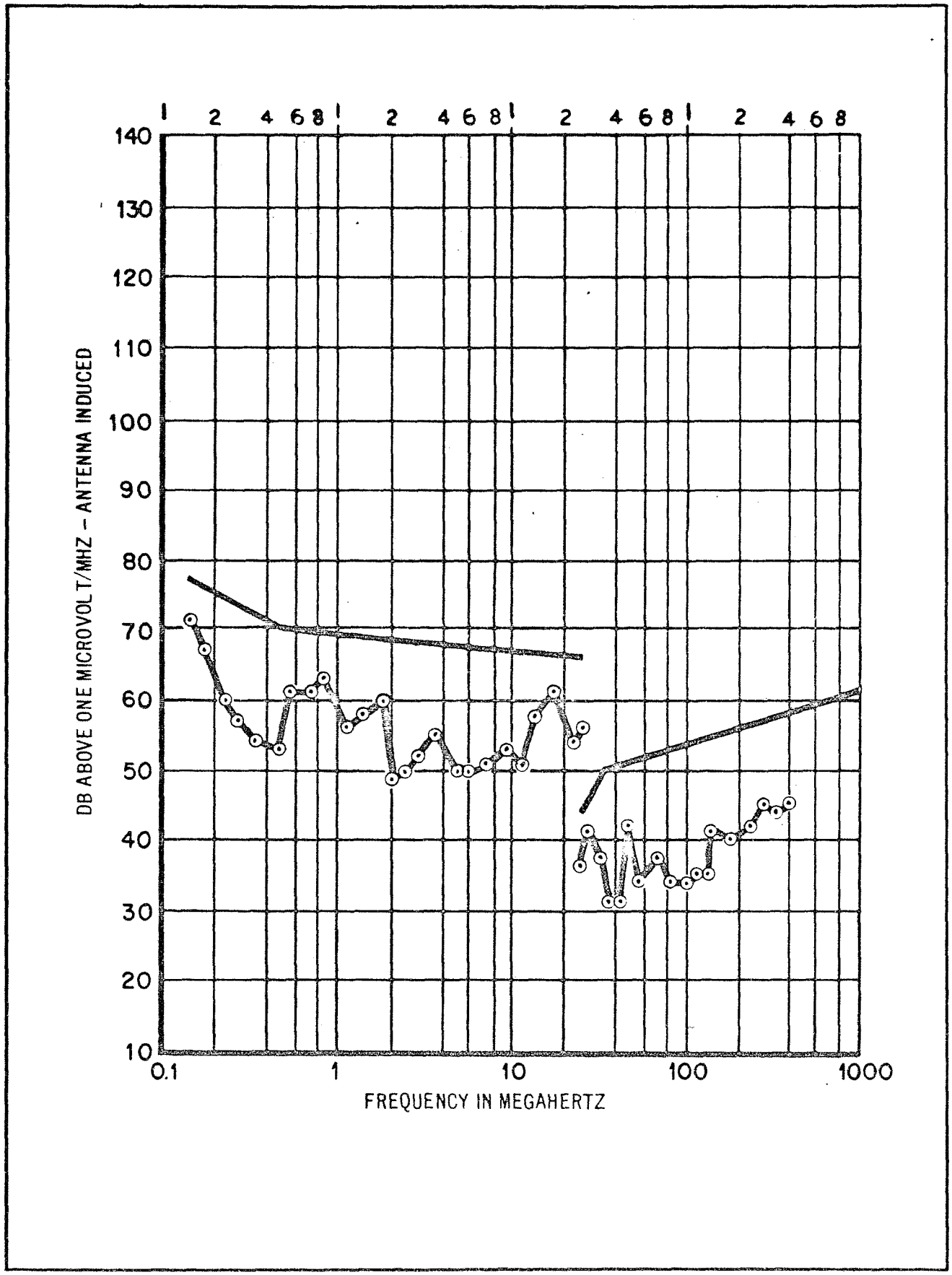

Figure 10–6. Model DSV–4B–296 Test Results
Broad Band Radiated Interference (Monitoring Equipment "OFF")

Line Item, Model Number Cross Reference

Model	Line Item
DSV-4B-123	AA-21
DSV-4B-125	Z-4
DSV-4B-126	Z-5
DSV-4B-127	AA-9
DSV-4B-128	AA-23
DSV-4B-136	AA-16A
DSV-4B-296	AA-73